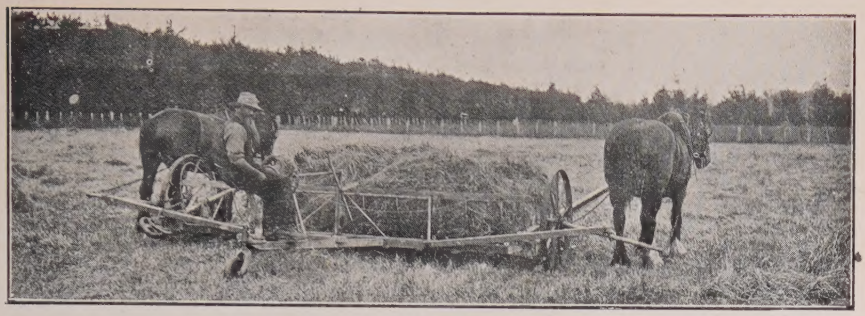

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THE GRASSLANDS OF NEW ZEALAND.*

PRINCIPLES OF PASTURE ESTABLISHMENT.

E. BRUCE LEVY, Biological Laboratory, Wellington.

NEW Zealand is essentially a land of pastures, and the endeavour of its farmers is to grass every type of country from the sea-shore to the line of perpetual snow. In no other country is the farmer more dependent—or, rather, more able to depend—on pastures for the sustenance of his stock than in New Zealand. The study of pastures is therefore, with us, of national importance, and their improvement of national gain.

Each type of pasture decidedly has a life-history—a life-history subject to modification under the many vicissitudes of soil, climate, and environment, made complex or simplified according to the species concerned in the pasture association, and by the method of utilization of the feed produced. Given constant conditions. we get a definite life-history. For instance, in a pure cocksfoot association unstocked and harvested each year for seed we get, for an indefinite

* During the past ten years the writer has carried out a great deal of work on the grasslands of New Zealand as a whole, and this article begins a series planned to place before farmers the results of those investigations. In the course of these studies he has endeavoured to so record the results that they may be presented in an attractive and simple form, and in this the camera has been made use of to a very large extent. He has been greatly assisted also by the advice and guidance of Mr. A. H. Cockayne, Biologist to the Department.

period of years, a pure association, but just so soon as the important factor of stocking is brought to bear the life-history of that association becomes modified (Fig. 1).

Our country, ecologically speaking, is one of uneven climate, and of varying soil-surfaces and topographical features. It is also one of varying farm practice and management. The larger the area we investigate at any one time the more fully is this statement borne out, and the smaller the area we investigate the more constant will be the influencing factors and hence the less applicable will such statement be. In dealing with pastures in a wide sense, therefore, very little information as to the treatment of any one special type of soil can be given; yet when we study the whole problem we find, as one would naturally expect, that there are certain basic principles underlying the establishment and maintenance of our grasslands in general. It is my intention to outline these basic principles, and later to show how they may be correlated with those special conditions existing in any one particular district or locality. In other words, an endeavour will first be made to get a good general knowledge of the factors governing pasture establishment and maintenance, and then to consider in detail the application of these principles to special types of soil.

Many farmers know, and know only too well, that of the species of grasses and clovers they include in their mixtures only a few may be represented in the pasture a few years after sowing. The species they have sown have disappeared, and other plants, generally weeds that they did not sow, have come in (Fig. 2). Changes have taken place, and the question may well be asked, What are the factors which influence these changes, and what consideration should we give that these weed successions may be avoided? I claim that the weed succession can be to a large extent prevented, but that changes of species in the grass cover on most soils cannot economically be avoided. The permanent sward must be reached by a series of gradual changes in the pasture, and the fact that these changes will and do take place must be recognized and faced by the farmer. In almost every type of soil there will be a changing or transitional period, and the recognition of this period by the farmer and a guiding of the transition through that period is one of the fundamentals of permanent-pasture establishment. Transitions in our grasslands will be dealt with in the next article of this series, and their significance will then be clearer.

Among all the types of country which the farmer has to grass the transitional period is least marked on good average first-class country (Fig. 3), and of the types to be considered this one affords a convenient starting-place.

I. GOOD AVERAGE FIRST-CLASS LAND.

The successful grassing of this type of land really affords fewer problems than that of any other. A complete sward of grass on such land is very easy to secure, but we must bear in mind that because the surface is completely clothed with grass and other vegetation it does not necessarily follow that that cover of vegetation is the best possible one that the farmer could attain on that particular soil. Fertile soils in temperate climates will support almost any plant, the factor of high fertility meeting in most cases the demands even of the most ravenous

FIG. 1. COCKSFOOT, WITHIN THE PLANTATION, OVER TWENTY YEARS OLD. UNDER GRAZED CONDITIONS, OUTSIDE THE PLANTATION (IN FOREGROUND), DANTHONIA HAS REPLACED THE COCKSFOOT.

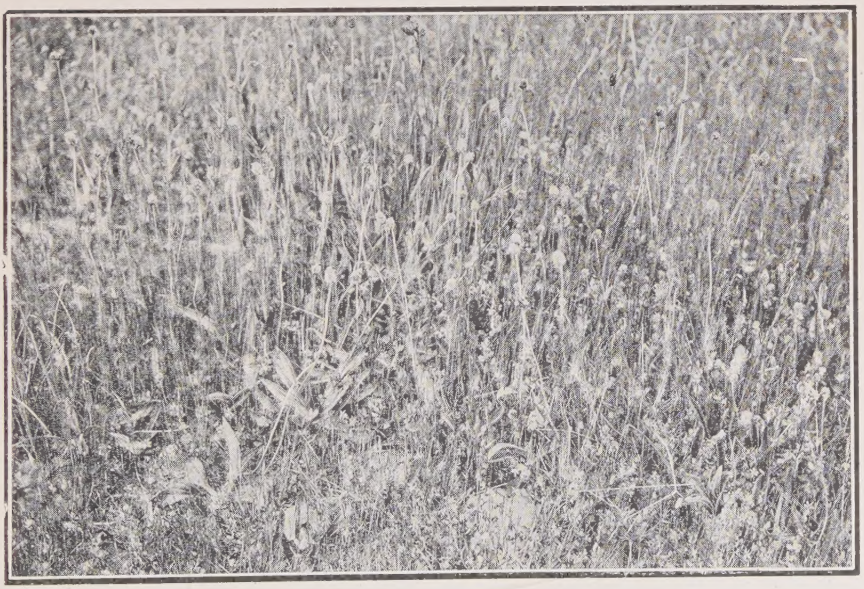

FIG. 2. PERMANENT PASTURE WHERE THE SOWN SPECIES, RYE-GRASS AND RED CLOVER, HAVE BEEN ENTIRELY REPLACED BY RIB-GRASS, SUCKLING-CLOVER, AND GOOSEGRASS.

of those species which are included in the sowing. Again, the capillary attraction in such soils is better than in the coarser, more gravelly soils, and consequently their moisture content is higher and more uniform. This factor of a more uniform soil-moisture is of very great importance to the longevity of certain of our pasture-plants, whose growth and very existence depend on conditions being such that free root-formation may take place at the surface of the soil, which is not possible unless moist and shady conditions prevail at the soil-surface. With grasses in general it must be recognized as a fact that the root-system is not a permanent accessory to the plant. Each year a fresh root-system is developed (Fig. 4), and with the exception of those plants of a creeping underground-stem nature, or short-tillering rootstock, the new root-system has its origin from a node of the creeping stem of the grass or from the base of the stem immediately above the soil-surface. We can therefore easily understand that if such portions of the plant are exposed to drying winds owing to bare patches or thin sole of grass, or through too close grazing, a fresh root-system cannot develop and a stunted grass-growth results.

In establishing a permanent pasture on good average first-class land it is expected that some at least of all species sown will survive (excluding the purely temporary elements as represented by Italian rye-grass), and will form part and portion of the herbage of the pasture throughout its life-history. This is not the case with any other type of pasture. In all other types, as before mentioned, one has to recognize the transition period in which changes take place in the pasture association, owing to certain of the constituents, which for economic reasons must be included in the sowing, running out and being displaced by other species more suited to occupy that particular soil. In good land, however, where the demands of each plant are catered for, each is able to persist, and when establishing a pasture on such land it is really a question of a selection of those plants which will combine well and produce the maximum amount of feed spread over the maximum period through the year.

Any farmer can produce a sole of grass on good country, yet to make that soil produce the maximum it is capable of demands as much skill as do the poorer types of country. The farmer is apt, however, to "rest on his oars," as it were, once the ground is completely covered with grass of almost any description, and very often in the course of investigation one has cause to be disappointed with the pastures produced on really good country.

THE MIXED PASTURE.

On many types of soil we must rely for permanent pasture on more or less pure associations—danthonia, for instance, on much steep, unploughable country. But where there can be produced mixed pasture, then such should be one's aim. Mixed pastures are preferable because (1) their growth-period is more uniform throughout the year than is that of pure pastures; (2) they offer a variation of feed for stock; and (3) the plant companionship is often mutually beneficial to the individual of the association. A short consideration of these points will make their importance clearer.

FIG. 3. PERMANENT PASTURE ON GOOD AVERAGE FIRST-CLASS LAND.

FIG. 4. SHOWING THE TEMPORARY NATURE OF THE GRASS ROOT-SYSTEM.

The young roots springing from just below the crown of the plant become the functional roots, the older roots dying off.

FIG. 5. A SMALL PATCH OF PASPALUM (IN CENTRE) GRAZED QUITE CLOSE, WHILE THE MASS OF FEED — PERENNIAL RYE-GRASS, COCKSFOOT, AND STRAWBERRY CLOVER—IS GROWING RANK.

FIG. 6. TALL FESCUE IN EXCESS IN A PERMANENT PASTURE OF CRESTED DOGSTAIL, COCKSFOOT, PERENNIAL RYE-GRASS, POA TRIVIALIS, AND WHITE CLOVER.

(1.) Uniformity of growth-period: The ideal pasture is one that will produce the maximum amount of feed spread evenly over the whole period of the year. To secure such a pasture, we know, is an impossibility. If it were possible grass-farming would be easy. There would be no need of any fodder crops, hay, &c., because feed produced from grassland is the cheapest food, and the cheaply produced food is always the most economical to use. Unfortunately, the seasonal yield from our grasslands is not uniform, and more expensive feeds must be produced in order that in the flush of the season there will not be too much waste of grass through carrying insufficient stock. Just so near, however, as we approach the ideal pasture in farming, just so much credit is reflected on our management. The mixed pasture will approach nearest to this ideal.

(2.) Change of diet: The appetite of live-stock is akin to our own, and one does not need to emphasize the fact that the human being sickens of a monotony of diet. The system demands a change, even although it may mean the consumption of certain foods generally accepted as unpalatable. Palatability, therefore, must be looked upon as a variable thing, and the palatability of a food will depend very largely on its relative mass in comparison to the other foods. Turning to our pastures it is found, for example, that where we have a mixed pasture of English grasses, and where there are patches of paspalum in that pasture, such patches will be eaten absolutely close, while the mass of feed may grow rank (Fig. 5). If, on the other hand, there is a patch of those same English grasses in a paspalum field they will be grazed bare and the paspalum neglected. Thus are we likely to get a wrong conception of palatability. Certainly in a mixed association certain species are preferred by stock to others (Fig. 6), and once a species in a pasture is left uneaten it is a sure indication that that species is in excess. But it does not necessarily say that such species should be eliminated from the pasture altogether. One plant of tall fescue in twenty acres of a good mixed pasture may constitute an excess; a thousand plants of tall fescue in one acre of paspalum may not constitute an excess. The balancing of the pasture ration is very important. The stimulation of the appetite of stock does not receive sufficient attention. The human knows that a little salt or a little herb in one's food makes it more palatable, and more of that food is eaten. Stock are essentially machines for the elaboration of raw materials into concentrated products, and if they can be induced to take in more food by presenting it to them in an attractive form, then they will do more work for us—that is, if there is an excess of feedstuffs for them to work on. The mixed pasture from the variety-of-food viewpoint is certainly important.

(3.) Value of plant companionship: Particularly is this point true of the clover content of the pasture. The clover content of our pastures should be looked upon as being one of the most vital factors in the life-history of any pasture association. If we can keep the clovers going, the grasses will look after themselves. The companionship of clovers and grass is most marked. If clover be excluded from grass association on any but the fertile soils a more or less dried-up, stunted growth results, lacking that healthy green colour which reflects full nutrition and a tender palatable herbage (Fig. 7). Grasses respond rapidly to nitrogenous manures, as shown by the effect of the droppings of stock in promoting the patchy, uneven growth of pastures where

FIG. 7. COCKSFOOT PASTURE WITHOUT CLOVERS, SHOWING DRIED-UP, STUNTED APPEARANCE.

FIG. 8. COCKSFOOT FIELD, SHOWING VIGOROUS GROWTH ON PATCHES MANURED BY CATTLE-DROPPINGS.

such droppings are not scattered by the harrow (Fig. 8). In general, however, it is not a sound practice to apply nitrogenous manures to grassland, as that particular element of plant-food contained in such manures is readily manufactured by the clover-plant in virtue of the nitrogen-fixing bacteria within the root-nodules. The clover-plant also manufactures nitrogenous foods not only in sufficient amounts for its own nutrition but in excess, the surplus being soon made available for the grass with which that clover is growing.

Again, apart from the benefit as a food-producing companion, the clover content of a pasture is valuable from the fact that the surface layer of soil is shaded and kept moist by the close leaf cover (Fig. 9),

FIG. 9. WHITE CLOVER AS A COMPANION PLANT TO PERENNIAL RYE-GRASS.

The clover-growth keeps the soil surface cool and moist, which conditions make possible the development of a fresh root-system in the grass.

and, as has been pointed out, this fact makes possible a greater surface-root production by the grass, which is so essential to its proper nutrition. This state, of course, may be secured by plants other then clovers, but the principle is the same. Plants inclined to tussock become exposed, with consequent ill effects owing to drying out, &c. Thus the mixed pasture should be the aim of the farmer.

MIXTURE FOR FIRST-CLASS LAND.

The following is a good general mixture recommended for the sowing-down of permanent pasture on the type of first-class country here referred to: Perennial rye-grass, 15 lb.; cocksfoot, 10 lb.; crested dogstail, 3 lb.; timothy, 3 lb.; Italian rye-grass, 4 lb.; red clover, 3 lb.; white clover, 2 lb.: total, 40 lb. per acre.

(To be continued.)

THE CLASSIFICATION OF VIRGIN LANDS OF THE NORTH ISLAND.

B. C. ASTON, F.I.C., F.N.Z.Inst., Chemist to the Department.

THE classification of virgin lands in a new district with no settlement or accumulated experience to guide the surveyor is often a difficult matter, and one which may require aid from more than one science in determining what the probable agricultural value of any given area may be. The following brief article will endeavour to set forth in the order of their relative importance the principles which should guide the soil-surveyor in arriving at a decision.

In the 1907 Annual Report of the Department of Agriculture, page 109, the writer summarized the principles which in his opinion should guide those who might in the future undertake a flying soil-survey of New Zealand. These remarks applied to the whole country, and the work was classified into a consideration of (1) climatic conditions, (2) conditions of surface, (3) geological origin and relation, (4) physical and chemical characters, (5) flora, and (6) recognized economic adaptations.

The present paper is restricted to the classification of virgin lands in the North Island, and by confining the consideration to this area it becomes easier to generalize. In the North Island the climate is more equable, there being no arid or semi-arid districts like those of Central Otago and Marlborough, and no large extent of abnormally moist areas such as those of the Fiordland and of Westland, while in temperature there are not the great extremes found in the South Island. The soils are generally derived from the old sedimentary rocks (poor in lime), similar to those forming the Southern Alps, the main exceptions being the "papa" and other sedimentary rocks (rich in lime), the eruptives of the Central Volcanic Plateau, and those of Mount Egmont and the Auckland Isthmus and Peninsula. Compared with the South Island there is little variation in the plant covering of most of the North Island. With the sinking into uniformity of the climatic and geological conditions, and to a large degree of the plant covering, there emerge in importance the conditions of surface and the texture and chemical composition of the soil. By dividing the North Island into districts this elimination can be further accentuated, and climate and geological origin diminished as factors or left out of account altogether.

The most important characters to be taken into consideration in classifying lands are those which are included under the heading of "Topography and position." These deal with (1) the contour of the surface—*i.e.*, whether it is flat, undulating, hilly, or steep and broken—and (2) the situation of the land, dealing with its position relative to the sun (latitude, altitude, and aspect) and to the sea or great lakes, or, in the case of arid country, to means of irrigating it (rivers, artesian supply, &c.).

Next in order is a consideration of the composition of the soil itself (including the subsoil), which includes a knowledge of the mechanical

composition or the relative amount of the differently sized particles composing it, conveniently grouped in the descending order of their fineness under the names of clay, silt, sand, and gravel (wholly peaty soils, mechanically considered, stand in a class by themselves), and a knowledge of the chemical composition, which in most cases will resolve itself into a question of the relative amounts of available lime and phosphates the soil contains. An accurate knowledge of the origin of the soil—*i.e.*, from what class of rock it has been derived, and whether it is a transported or sedentary soil (one formed *in situ* from the parent rock)—may be of value in assisting the surveyor to diagnose the class to which any area of land belongs.

Excepting unstable dune-sands and some recent eruptive country, New Zealand lands in a state of nature support a more or less continuous plant covering of some kind, the quality and quantity of which is some indication of the quality of the soil. The quality of the plant covering is most largely dependent on the water-supply for its character, and hence a knowledge of the climate should be helpful to a surveyor in forming his opinion. The science of the soil is in its infancy, and it is possible that as a knowledge of soil micro-biology increases this branch of science may be of more value in differentiating types of soil than any of the other means which are not applicable in the field at present. However, this aspect must here pass unconsidered.

What has been said may now be summarized under the following headings :—

I. Topography.

(1.) Contour: (*a*) Flat, (*b*) undulating, (*c*) hilly, (*d*) steep and broken.
(2.) Position: (*a*) Latitude, (*b*) altitude, and (*c*) aspect (relative to the sun), (*d*) distance from sea or great lakes (relative to great bodies of water).

II. Composition of Soil.

(1.) Mechanical composition: (*a*) Clay, (*b*) silts, (*c*) sands, and (*d*) gravel (mineral or inorganic), (*e*) peat (organic).
(2.) Chemical composition: (*a*) Presence of available lime, (*b*) amount of phosphates, potash, and nitrogen present.

III. Plant Covering (dependent mainly on Climate).

IV. Geological Origin and Mode of Formation.

TOPOGRAPHY.

With regard to "Contour," it will no doubt be true generally that these classes are set down in the descending order of their relative value, although occasionally it does happen that higher, steeper lands will be of greater value than the lower flats. This often occurs in recent volcanic country, such as that formed in the Volcanic Plateau of the North Island, an altogether abnormal area, concerning which little accurate information is available. In this article the North Island Volcanic Plateau and the soils derived or modified by the volcanoes of that region must be treated as an exception to which some of the generalizations are inapplicable. Another exception which must be ranked with the pumice soils is that of the dune-sands. The pumice soils are highly abnormal, and, so far as the writer can learn, are unique in the history of agriculture. The dune-sands, however,

occur in many parts of the world, and the treatment necessary to bring them under profitable occupation has been well worked out in Europe. The pumice gravels or sands consist of highly porous, coarse rock-particles, loosely consolidated (having been deposited from the air), and have not had the advantage of having been sorted out and acted upon by running water, neither have they the geological age which would have enabled them to become weathered to a much finer state. Owing to the high and well-distributed rainfall these pumice soils support a natural vegetation, which may be either forest, heath, tussock-grassland, or fernland. The grazing-capacity of the improved land varies greatly, apparently being dependent on the fineness of the particles, the degree of consolidation, and the amount of humus which is present. Where such soils have had the advantage of being submerged or sorted out by lake or river waters, or mixed with finer particles by more recent eruptions, or mixed with the abundant decaying vegetation of lakeside situations, the pasture which grows on these lands when (where necessary) the water is drained off is highly nutritious as food for ruminants. Where, however, the soil occurs in some other situations uninfluenced by the benign agencies stated the luxuriant pasture will not support ruminants, which become unthrifty, and finally, in the course of months, if not removed, become affected with malnutrition disorder.

The dune-sands are a comparatively unimportant portion of the North Island, and suffer from the same mechanical defects—*i.e.*, an excess of the larger particles of soils and a deficiency of organic matter—a character which renders it advisable that when a pasture is established on these soils its improvement should be effected by top-dressing rather than by tillage methods. The accumulation of humus which always takes place in grasslands should be encouraged on all undulating and hilly sand-land. Ploughing has the tendency to destroy the good which has been brought about by the accumulation of organic matter in the soil.

Steep and broken country is placed lowest in the series. An apparent exception is papa country of the right sort, which is often steep and broken, and on which slips are frequent. The pastoralist, however, views the slips with equanimity, as the pasture which speedily appears on the new scar is better than the original, owing probably to the larger amount of carbonate of lime which is to be found in the new soil. Certainly the growth of clover on the slips is often phenomenal.

In regard to "Position," owing to the longer period of active growth, land in a lower latitude should be more productive than in a higher latitude. Altitude must be similarly considered, land at a lower being classed better than land at a higher altitude. Aspect is sometimes of importance, the value of land with an inclination to the sun and which intercepts a maximum of the sun's rays being higher than that of land which receives less. Position with regard to the sea, and to a less degree to large bodies of fresh water, is important, as in such cases the temperature of the soil and air is more equable. Sea littoral pastures are usually better than those on the same rock and soil farther inland. This is possibly partly owing to the chemical influence of sea-spray or to the past influence of sea life (usually abundant on sea-coasts) in increasing the content of phosphates and carbonates of lime in the soil.

COMPOSITION OF SOIL.

A soil suffering from one of the more obvious defects of mechanical composition, such as an excess of sand or gravel, will be noticed in the field, but as a rule a mechanical analysis will be required before the class to which any soil belongs may be determined. The difficulty in surveying soils is not so much in recognizing types as in being able to determine the boundaries of those types which so often imperceptibly shade off at the margins in admixture with the adjoining types.

The value of mechanical analysis is more to correlate soils of similar composition than to derive any positive information as to the excess or deficiency of a given fraction whose particles vary only within definite limits. British authorities agree that the properties of the finest fraction of soils—clay—are of great importance to the fertility of the soil, no constituent being more necessary in proper proportions or more harmful in excess. From 8 to 16 per cent. is stated to be a satisfactory proportion in the soil where the rainfall is 20 in. to 30 in. a year. Hall ("The Soil") states that good wheat-land or land that will form sound permanent pasture will contain at least 30 per cent. of silt and clay.

"Fine silt," like clay, has a great water-holding power, and amounts above 10 to 15 per cent. are held to be excessive, increasing the difficulty of working the soil, especially if much clay is present. The stickiness of fine silty soils, not having the colloidal and plastic properties of true clay, is said to be less altered by lime. The fraction "silt" appears to be a very valuable one, judging by the large proportion in which it exists in many of the most fertile soils in England, 30 or 40 per cent. of which consists of this fraction. The lighter soils, which contain only from 10 to 20 per cent. of silt, will probably require some treatment having for its object the increase of the organic matter of the soil.

Fine sand forms usually from 20 to 30 per cent. of nearly all soils, but coarse sand is perhaps the fraction most variable in soils, its properties having the reverse effect of clay, keeping the soil open and friable. An excess of coarse sand—40 per cent. or more—or less than 5 per cent. of clay, unless the water-supply is exceptionally good, would render a soil hard to cultivate, owing to the difficulty in retaining moisture. As the amount of coarse sand increases, this difficulty becomes greater until conditions are reached under which only specialized plants are capable of growing. Hence such soils are barren for ordinary crops, special methods of treatment having to be adopted, such as growing lupins, in order to form a plant covering. Finally we have the gravelly soils, which in extreme cases, where unmixed with finer soil, are hopeless for anything except forestry.

Some of the foregoing are opinions with regard to lands of the United Kingdom, and they are possibly true only of countries of similar climate. What effect the different climate of New Zealand may have in modifying the above conclusions is yet to be decided.

Peaty soils are invariably the result of swampy conditions, and usually require draining and some form of after-treatment, such as liming or burning, before they can be brought to their maximum productiveness. In some cases, however, in which the organic matter has become mixed with mineral matter by flood-waters or air-currents in the vicinity of volcanoes, draining is the only treatment required to convert the swamps into high-class grazing-land.

The chemical composition of the soil is one which can be satisfactorily determined only in the laboratory. The presence of available lime when present as carbonate could be detected, however, in the field by merely pouring some acid upon the soil, an effervescence, of course, indicating the presence of a carbonate, which is usually carbonate of lime. Some recently formed soils, however, contain calcium in a form which is not carbonate, but which yet dissolves in dilute hydrochloric acid without effervescence. The natural presence of carbonate of lime in the virgin surface soil will be a very rare occurrence in the North Island, being probably restricted to papa country and lands flooded by waters bearing papa silt.

The classification of soils by means of their content of plant-food is tabulated in the following form. Maercker's figures refer to the total amount of plant-food which may be dissolved out with strong acids, and which may therefore be supposed to become ultimately available. B. Dyer's figures are obtained by a method intended to give some idea as to the amounts of plant-food which are immediately available.

Classification of Soils by Plant-food Percentages (Maercker's Rating).

Grade of Soil.	Phosphoric Acid. Per Cent.	Nitrogen. Per Cent.
Poor	Below 0·05	Below 0·05
Medium	0·05 to 0·10	0·05 to 0·10
Normal	0·10 to 0·15	0·10 to 0·15
Good	0·15 to 0·25	0·15 to 0·25
Rich	Above 0·25	Above 0·25

Rating adopted for Available Plant-food, as determined by B. Dyer's Method.

Grade of Soil.	Potash. Per Cent.	Phosphoric Acid. Per Cent.
Deficient	Below 0·005	Below 0·01
Normal	0·005 to 0·01	0·01 to 0·015
Good	Above 0·01	Above 0·015

SOME RECENT CHANGES IN THE NAMES OF PLANT-DISEASES.

[*Continued from September Issue.*]

G. H. CUNNINGHAM, Biological Laboratory, Wellington

KEY TO THE REASONS FOR CHANGES IN NAMES.

In the several parts which follow the reason for the change in scientific names is indicated in each case by a Roman numeral "I," "II," &c. This numeral indicates that the change has been made for the reason briefly summarized in the corresponding key paragraph as follows:—

I. Change necessitated through the perfect stage of the causative organism becoming known.

II. Change necessitated through the generic name of the causative organism becoming untenable.

III. Change necessitated through the adoption of the International Botanical Rules, Brussels, 1910.

IV. Change necessitated by the difference between American and international nomenclature.

V. Change necessitated through the previous wrong determination of the causative organism.

Rejected common names are also given, but are not keyed—*i.e.*, the reason for rejection is not given in their case.

PART I.—ORCHARD TREE AND FRUIT DISEASES.

In the following pages the various diseases are arranged in alphabetical order under their common names, which in turn are placed under three headings—(*a*) pome, (*b*) stone, and (*c*) citrus fruit-trees. No attempt has been made to give a complete list of synonyms, the names that have been used in New Zealand literature alone being given.

(*a*.) POME FRUIT-TREES AND FRUITS; INCLUDING APPLE, MEDLAR, PEAR, AND QUINCE.

1. **Apple-canker,** *Nectria galligena* Bres.

This fungus, under the name of *Nectria ditissima* Tul., has been recorded as being parasitic on the apple in New Zealand, but it is doubtful whether it occurs here. All the cankers supposed to be due to this fungus, and examined by me, have in reality been caused by black-rot (*Physalospora Cydoniae* Arnaud).

As the term "apple-canker" should be retained for *Nectria galligena*, it will be necessary to abandon the term "canker," which in the past has so regularly been used for all large open wounds of fruit-tree branches, irrespective of the cause.

2. **Apple-spot,** *Phoma Pomi* Passer.

V. *Cylindrosporium Pomi* Brooks. Fruit-spot.

This fungus is common on certain stored varieties of apple, notably Sturmer Pippin.

3. **Bitter-pit** (Non-parasitic).

Stippen.

The cause of this diseased condition is not clearly understood. It appears that it is in a large measure caused by sudden loss of water due to excessive transpiration.

4. **Bitter-rot,** *Glomerella cingulata* (Stoneman) Sp. et v. Schr.

II. *Gnomoniopsis cingulata* Stoneman. III. *Glomerella rufomaculans* Spauld et v. Schr. V. *Gloeosporium fructigenum* Berk. I. *Gloeosporium rufomaculans* (Berk.) Thüm. Bitter-rot canker; ripe-rot.

A great deal of confusion exists in mycological literature as to the correct specific name to adopt for this species, and it is frequently discussed under one or other of the synonyms cited above.

In New Zealand this fungus is the cause of a serious loss to apple-growers both in the orchard and the cool store. It attacks both fruit and trees—on the former forming sunken brown patches which are bitter to the taste, and on the latter large cankers which are almost identical in appearance with those caused by black-rot.

5. **Black-rot,** *Physalospora Cydoniae* Arnaud.

I. *Sphaeropsis Malorum* Berk. I. *Macrophoma Malorum* Berk. V. *Macrophoma Mali* (see note below). Black-rot canker; black-rot leaf-spot; body-canker; body-blight; fruit-spot.

This organism is the cause of a considerable amount of damage to apple and pear trees. It attacks laterals, spurs, and branches, forming

large open wounds. The portion of the attacked branch above the canker invariably dies. When the fruits are attacked they quickly turn black and become mummified. It is from this blackened appearance that the organism derives its common name.

Two conidial stages are common in the life-cycle of this fungus. On fruits *Sphaeropsis* is the common stage; on laterals and the surface of cankers *Macrophoma* is the more common, often persisting up to the time of the development of asci.

M. Mali is a name that has in manuscript been applied in error to *M. Malorum*. This error was due to the fact that at the time in question this Laboratory was in process of removal, consequently the determination was made when no text-books were available.

6. **Black-spot** (apple), *Venturia inaequalis* (Cke.) Aderh.

II. *Sphaerella inaequalis* Cooke. I. *Fusicladium dendriticum* (Walr.) Fcl Apple-scab.

This fungus attacks the fruit, leaves, and wood of the apple. On the fruit it forms black patches which somewhat distort the apple, especially if the fruit is attacked whilst young. On branches small irregular cankered areas are formed. This fungus does not attack the pear.

7. **Black-spot** (pear), *Venturia Pirina* Aderh.

I. *Fusicladium Pirinum* (Lib.) Fcl. Pear-scab.

This fungus is confined to the pear, attacking the fruit and leaves and forming irregular cankers on the shoots. The ascigerous stages of apple and pear black-spot have recently been found in New Zealand, so that the life-history is similar to that of the European form.

8. **Coniothecium Blister,** *Coniothecium chomatosporum* Cda.

Apple-scab.

This is the cause of the scabbing and cracking of apple fruits and the stunting of certain varieties of apple-trees, notably Scarlet Pearmain. On the branches of these trees the fruiting-bodies are formed under the epidermis, which they raise into minute blister-like swellings distinctly discernible to the eye.

9. **Fabraea Scald,** *Fabraea maculata* Atk.

I. *Entomosporium maculatum* Lév. Leaf-blight; leaf-scald; leaf-spot.

This fungus attacks the leaves and fruits of pear and quince, forming spots which are similar in appearance to those caused by the pear "black-spot" organism.

10. **Fireblight,** *Bacillus amylovorus* (Burr.) Trev.

II. *Micrococcus amylovorus* Burr. Blight-canker; blossom-blight; collar-blight; fruit-blight; pear-blight; root-rot; twig-blight.

A bacterial disease which in New Zealand has been found on the apple, hawthorn, pear, quince, and medlar, the latter being a new host for this organism.

11. **Glassy Core** (non-parasitic).
Water-core.

This condition is not caused by any pathogen, but is due to the presence of excessive water in the affected tissues. Apples alone are affected.

12. **Pink-rot,** *Cephalothecium roseum* Cda.

This is an uncommon disease of the apple and pear, on which fruits it forms somewhat circular, brownish patches. It is a wound parasite, and cannot effect an entry other than through skin-injury of some kind.

13. **Powdery Mildew,** *Podosphaera leucotricha* (Ell. et Ev.) Salm. and *Podosphaera Oxyacanthe* (DC.) de Bary.
II. *Sphaerotheca leucotricha* Ell. et Ev. I. *Erysiphe Oxyacanthe* DC.
Apple-mildew; cherry-mildew.

Two organisms are concerned in the cause of powdery mildew. As neither can be determined from the conidial stage alone, and as perithecia are but rarely found, it is difficult in ordinary practice to separate these two species.

14. **Root-fungus,** *Rosellinia radiciperda* Mass.
Root-rot.

This fungus attacks and destroys the bark covering the crown and larger roots of a great number of trees. It has proved to be particularly destructive to apples and pears in some localities.

15. **Root-knot,** *Pseudomonas tumefaciens* E. F. Sm. et Towns.
II. *Bacterium tumefaciens* E. F. Sm. V. *Dendrophagus globosus* Toum.
Crown-gall; hairy root.

This organism has in New Zealand been recorded on pome and stone fruits. In America it has been recorded as causing galls and knots on a large number of different plants.

16. **Silver-blight,** *Stereum purpureum* Pers.
Silver-leaf.

This fungus is the cause of a serious annual loss to orchardists, particularly those who have stone-fruit orchards. It is common on the apple, and has recently been recorded on the pear. It also attacks a large number of trees other than orchard-trees; for example, I have collected it on poplar, willow, manuka, &c. It is a wound parasite, and enters the tree through wounds made in pruning or ploughing.

17. **Sour-sap,** *Fusarium lateritium* Nees.

This organism has proved destructive to young apple-trees in certain seasons, but it has been shown that attacks from it are but secondary conditions following unfavourable conditions to which the tree has been subjected, such as excess water in the soil.

The fructifications of this fungus may readily be distinguished from those of *Nectria cinnabarina* (q.v.) by the fact that the pustules of *Fusarium* are pale salmon in colour, and are larger and more irregular in shape; *Nectria* pustules are the colour of well-burnt bricks.

(*b.*) STONE-FRUITS AND FRUIT-TREES; INCLUDING ALMOND, APRICOT, CHERRY, PEACH, AND PLUM.

18. **Black-knot,** *Plowrightia morbosa* (Schw.) Sacc.
II. *Sphaeria morbosa* Schw.

This organism causes cankers on the branches of plum and cherry trees; I have not seen the ascigerous stage.

19. **Bladder-plum,** *Taphrina Pruni* (Fcl.) Tul.
II. *Exoascus Pruni* Fcl. Plum-pockets.

This fungus is the cause of a considerable amount of damage to plums. It causes the young fruits to grow more rapidly than normal healthy fruits until they become bladder-like and quite hollow; in this condition they persist for a time, then drop off. Where infection has been severe the whole crop may be lost in this manner.

20. **Brown-rot,** *Sclerotinia cinerea* Schröt.
V. *Sclerotinia fructigena* Schröt. I. *Monilia cinerea* Bonord. I, V. *Monilia fructigena* Pers. Blossom-blight; peach-rot; ripe-rot; twig-blight.

In New Zealand this fungus has long been known as *Sclerotinia fructigena,* owing to a misdetermination on the part of a mycologist whose publications were at one time largely followed in this Laboratory. Brown-rot attacks peaches, apricots, cherries, and plums.

21. **Cherry-curl,** *Taphrina minor* Sadeb.
II. *Exoascus minor* (Sad.) Sacc.

This fungus is of rare occurrence; it attacks and distorts the leaf in a manner similar to leaf-curl.

22. **Cladosporium Freckle,** *Cladosporium carpophilum* Thüm.
Black-spot; peach-freckle; peach-scab.

This fungus causes irregular scabbed areas on maturing fruits of peach and apricot.

23. **Coral-spot,** *Nectria cinnabarina* (Tode.) Fries.
II. *Sphaeria cinnabarina* Tode. I. *Tubercularia vulgaris* Tode. Apricot-gummosis.

This is a wound parasite, common on various trees where these have been damaged by ploughing, or pruning, or weakened by excess of soil-water. It is also a common saprophyte, occurring abundantly on prunings and dead sticks that are in contact with the ground.

24. **Die-back,** *Clasterosporium carpophilum* (Lév.) Aderh.
V. *Helminthosporium carpophilum* Lév. Peach-scab; shot-hole.

In literature this fungus is often confused with *Coryneum Beijerinckii* Oud., with which it is probably identical; it is retained in the genus *Clasterosporium* because the New Zealand fungus more closely approaches this genus than it does the genus *Coryneum.* It attacks leaves and laterals of stone-fruit trees, notably peaches.

25. **Gnomonia-scorch,** *Gnomonia erythrostoma* Auersw.
Leaf-scorch.

This attacks the leaves of cherries; it is an uncommon disease.

26. **Leaf-curl,** *Taphrina deformans* (Fcl.) Tul.
II. *Exoascus deformans* (Berk.) Fcl. Curl; curly-leaf; leaf-blister; peach-blister; peach-curl.

This is the cause of leaf-curl and fruit-blotch on peaches and nectarines. The mycelium of the fungus persists in the tissues and is the source of fresh infection each year. Recently specimens of this fungus attacking the leaves and laterals of apricots were sent in to this Laboratory.

27. **Leaf-rust,** *Puccinia Pruni-spinosae* Pers.
III. *Puccinia Pruni* Pers. IV. *Tranzschelia punctata* Arth. Almond-rust; apricot-rust; peach-rust; plum-rust; rust.

This fungus attacks the leaves, shoots, and fruits of stone-fruits.

28. **Plum-spot,** *Pseudomonas Pruni* E. F. Sm.

A bacterial disease causing brown spots on the leaves and black spots on the fruit of certain varieties of plums, notably the variety Burbank. So far this disease has been sent in from only one locality.

(13.) **Powdery Mildew,** *Podosphaera Oxyacanthe* (DC.) de Bary.
(See also under "Pome Fruits.")

Although not common, this mildew is more or less generally distributed throughout New Zealand. Unless its attacks are severe it is readily overlooked.

(15.) **Root-knot,** *Pseudomonas tumefaciens* E. F. Sm. et Townsend.
(See under "Pome Fruits.")

29. **Shot-hole,** *Phyllosticta circumscissa* Cke.
Leaf-spot.

This fungus is the cause of the peculiar leaf-perforations so common on stone-fruits in certain seasons.

(16.) **Silver-blight,** *Stereum purpureum* Pers.
(See under "Pome Fruits.")

30. **Valsa Injury,** *Valsa leucostoma* (Pers.) Fries.
II. *Sphaeria leucostoma* Pers. I. *Cytospora cincta* Sacc. Die-back; peach-gummosis.

This organism attacks only through a wound of some nature, such as would be caused by pruning or plough injury.

(*c.*) CITRUS FRUITS AND FRUIT-TREES; INCLUDING CITRON, LEMON, AND ORANGE.

31. **Citrus Anthracnose,** *Phoma citricarpa* McAlp.
Black-spot.

The cause of black depressed spots in the epidermis of oranges.

32. **Citrus Brown-rot,** *Pythiacystis citrophthora* Sm. et Sm.
The cause of brown-rotting of fruits and the death of laterals.

33. **Citrus-verrucosis,** *Cladosporium Citri* Mass.
Verrucosis.
This fungus causes large nodular scabbed areas on fruits and leaves.

34. **Collar-rot,** *Fusarium Limonis* Brio.
Bark-rot; foot-rot; mal di gomma.
This fungus attacks and destroys the bark at the crown.

35. **Grey-scab,** *Sporodesmium griseum* McAlp.
An uncommon disease. It forms irregular grey scabs on the fruit.

36. **Sour-rot,** *Oospora Citrii-Aurantii* (Ferraris) Sacc. et Syd.
II. *Oidium Citrii-Aurantii* Ferraris.
This organism is occasionally found present in certain American and Island shipments of oranges. It causes an infectious soft rot, which is readily discernible by the strong acid odour.

37. **Wither-tip,** *Phoma omnivora* McAlp.
Die-back.
The cause of the dying-back of lateral shoots of citrus-trees.

(To be continued.)

TESTING OF PUREBRED DAIRY COWS.

OCTOBER CERTIFICATE-OF-RECORD LIST.

W. M. SINGLETON, Acting Director of the Dairy Division.

THE appended list comprises the records of all cows which have received certificates of record during October. As will be noticed, there are several productions which indicate animals of unusual calibre. Owing to lack of space and the pressure of duties which this period of the dairying year brings, it is not possible to refer particularly to individual records. The Friesian list, however, records a performance constituting a new class-leader. Monavale Queen Bess, commencing her test at an age sixteen days younger than Rosa Posch of Oakview, has defeated as leader of the junior two-year-olds the latter heifer's record of 19,515·5 lb. milk, containing 718·83 lb. butterfat, in 365 days, starting at 2 years 32 days.

SOME PEDIGREE NOTES ON MONAVALE QUEEN BESS.

Monavale Queen Bess was entered for test by the late Mr. W. Richards, of Cardiff, and after Mr. Richards's decease was continued under test by his son, Mr. T. H. Richards. This heifer's record of 20,501·1 lb. milk, containing 740·50 lb. butterfat, in 365 days, commencing at the age

of 2 years 16 days, is certainly a splendid performance, but is a production which might perhaps be naturally expected when one considers the large proportion of proven producers which her pedigree includes. Monavale Queen Bess was sired by King Laddie from Netherland Pontiac Princess. So far as records of production or records of daughters are concerned, both parents are practically unknown. The generations preceding those of the parents, however, contain the names of animals which have shown outstanding merit as producers, and a study of these records would lead one to conclude that Monavale Queen Bess would almost have been a sport (in the breeding sense) had she not proved herself a producer when given a fair opportunity on test.

Netherland Pontiac Princess, dam of the new class-leader, is from Netherland Princess IV by Woodcrest Pietje Pontiac, the bull which Mr. J. Donald imported from North America. Neither of these animals needs special introduction to readers of C.O.R. notes in the *Journal*. The record of Netherland Princess IV, of 805·77 lb. butterfat as a senior two-year-old, has not yet been superseded south of the Line, and is considered to have been a world's record when made, if regard be taken to all the conditions pertaining to calving, milking, &c. The daughters of Woodcrest Pietje Pontiac have proved themselves when on test to possess exceptional factors for production. Some of the highest producers have missed certificates, but Woodcrest Ida, owned by the Prisons Department, and commencing her test at the age of 2 years 136 days, has a certificate of record for 541·28 lb. fat, produced under conditions which were far from ideal.

King Laddie's sire is King of the Black-and-Whites, who is a son of Manor Beets Daughter II of Ashlyn. This cow still holds the leadership of the Friesian senior three-year-old class at 863·51 lb. butterfat. For quite a time this stood as our best New Zealand record. The sire of King of the Black-and-Whites is a son of Domino III by Sir de Kol Inka Pietertje. Readers will not have forgotten the high esteem in which Domino III was held as a producer of milk and butterfat.

One could write many pages on the animals figuring in the pedigree of Monavale Queen Bess. The strength of the pedigree will be noted by consideration of the names of Cliffside Laddie, sire of nineteen certificate-of-record daughters, with records up to 665 lb. butterfat; Paul Pietertje, with eleven certificate-of-record daughters, including Westmere Princess Pietertje, with a certificate for 939 lb. fat; Grace's Netherland of Riverside, with ten C.O.R. daughters, including Manor Beets Daughter II of Ashlyn, referred to above, and Grace Fayne of Ashlyn, with a C.O.R. for 716 lb. fat; and Homestead Girl de Kol Sarcastic Lad, the first American bull to win fame through the long-distance records of any considerable number of tested daughters. Dams appearing in the pedigree and not referred to above are Laddie's Queen, with a C.O.R. for 419·82 lb. fat produced in 198 days; Longbeach VI, with a credit of 630 lb. fat; and Longbeach Netherland Queen VII, with a credit of 659·31 lb. fat in 363 days; together with such noted American Friesians as Pontiac Clothilde de Kol II, who held the world's record for some time: and Pietje XXII, the highest-record cow ever imported from Holland.

We welcome the new class-leader, and extend our congratulations to her owner.

RECORDS FOR OCTOBER, 1921.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		FRIESIANS.				
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Monavale Queen Bess	T. H. Richards, Cardiff	2 16	242·1	365	20,501·1	740·50
Friesland Van Vola..	A. Migounoff, Matakana	2 17	242·2	304	10,903·0	400·40
Grace Colantha Pietertje	M. Fletcher, Auckland	2 50	245·5	365	9,395·0	308·71
Black Curly ..	C. R. Duncan and Sons, Whangamarino	2 19	242·4	299	7,631·1	300·23
Queen of the Dutch..	M. Fletcher, Auckland	1 304	240·5	282	8,120·8	296·28
Everslea Lady Lucy	R. Newell, Rangiora..	2 32	243·7	337	7,327·1	262·44
Foxbro Queen Pietertje	E. F. Walford, Aongatete	2 0	240·5	258	7,065·9	260·77
Senior Two-year-old.						
Venus of Norfolk Park	W. Potter, Mangere ..	2 274	267·9	324	7,690·1	284·95
Junior Three-year-old.						
Westbrook Gretchen	A. Migounoff, Matakana	3 15	278·5	309	12,849·8	428·62
Fayne Segis Belle ..	Borstal Farm, Invercargill	3 144	291·4	294	11,629·0	428·38
Everslea Countess Lotje	R. Newell, Rangiora..	3 5	277·5	338	9,712·1	325·06
Senior Three-year-old.						
Hauraki Grace ..	T. O. Hodgson, Tamahere	3 206	297·6	365	9,694·0	406·57
Hilda Minto ..	C. H. Steadman, Kamo	3 340	311·0	272	9,092·6	311·64
Junior Four-year-old.						
Riverlea Lunta's Dutch	C. H. Steadman, Kamo	4 151	328·6	365	15,266·1	552·69
Westbrook Pauline ..	A. Migounoff, Matakana	4 90	322·5	297	11,583·0	390·91
Monavale Corona Regina	E. F. Walford, Aongatete	4 18	315·3	327	8,842·1	344·03
Senior Four-year-old.						
Westbrook Heiress ..	M. Fletcher, Auckland	4 358	349·3	365	14,658·6	566·99
Mature.						
Silvey de Kol ..	T. H. Richards, Cardiff	7 314	350·0	365	16,090·3	612·36
Flower II	A. Thirlwall, Matamata	8 332	350·0	344	15,178·3	544·73
Eileen Girl ..	A. W. Chapman, Gordonton	5 341	350·0	358	13,328·0	436·25
Friesland Park Countess Lotje	R. Newell, Rangiora..	6 237	350·0	365	11,714·75	422·68
Countess Ena III ..	N. P. Nielsen, Tiakitahuna	5 125	350·0	364	12,292·5	419·77
		JERSEYS.				
Junior Two-year-old.						
Goneril	C. G. Gibbons, Ngaere	2 41	244·6	347	11,680·6	652·43
Molly Riley ..	W. Anderson, Aokautere	2 7	241·2	305	7,529·8	516·37
Mistletoe of Pelynn..	L. K. Tarrant, Ngaere	2 12	241·7	334	8,271·0	481·21
Willow Bank Molly..	T. Ranford, Whakaronga	2 11	241·6	305	8,458·2	447·45
Jersey Park's Myrtle	A. E. Death, Hawera	1 288	240·5	365	6,965·1	426·32
Jerseydale Fascination	J. Pettigrew, Pihama	1 314	240·5	365	7,741·0	412·78
Wairoa's Enid ..	H. J. Berry, Kaupokonui	1 357	240·5	365	6,884·4	411·03
Avoca's Daisy ..	C. H. Sharp, Te Roti	1 338	240·5	364	8,689·45	404·18

RECORDS FOR OCTOBER, 1921—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Junior Two-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Woodbine of Pelynn	L. K. Tarrant, Ngaere	1 363	240·5	308	8,050·5	400·15
Jerseydale Beauty ..	J. Pettigrew, Pihama..	1 348	240·5	365	7,916·7	396·15
Idalia	A. Christie, Hikurangi	2 8	241·3	365	7,290·9	392·66
Willow Bank Star ..	W. W. Robert, Whakaronga	2 31	243·6	365	6,596·2	391·64
Leontes	A. L. Hooper, Stratford	2 85	249·0	285	8,029·0	385·21
Eaton Mymy ..	C. A. Voullaire, Kaupokonui	1 364	240·5	365	6,648·2	379·46
Aratika Varna ..	D. Kennedy, Morven..	2 20	242·5	335	6,414·4	364·31
Jersey Park's Joy ..	A. E. Death, Hawera..	1 344	240·5	365	5,592·9	360·08
Woodland's Flora ..	H. C. Sampson, Hillsborough	1 345	240·5	360	5,683·3	357·10
Renown's Neatest ..	F. J. B. Ryburn, Ohaupo	1 333	240·5	365	6,878·4	355·66
Laurel's Silver Medal	F. Cresswell, Palmerston North	2 18	242·3	365	5,608·4	346·11
Calabria	R. D. Dagg, Kaponga	2 22	242·7	365	5,732·8	337·88
Perfecta	R. L. Tippler, Shannon	2 13	241·8	365	6,663·1	336·99
Falconite's Lady ..	F. J. B. Ryburn, Ohaupo	1 333	240·5	359	5,559·3	332·96
Dalethorpe's Joy ..	A. R. Clark, Hamilton	1 333	240·5	340	5,453·7	332·70
Willow Bank Coquette	F. Ranford, Whakaronga	2 15	242·0	318	5,947·2	331·83
Zena's Glory ..	S. R. Lancaster, Palmerston North	1 328	240·5	310	5,759·0	321·09
Aratika Faustine ..	D. Kennedy, Morven	2 8	241·3	331	5,870·6	304·40
Te Wiki Zest ..	T. S. Edwardes, Tiakitahuna	2 41	244·6	308	5,242·4	300·71
Viola's Daisy Girl ..	E. Griffiths, New Plymouth	2 13	241·8	291	4,640·3	283·73
Belvedere Dolly ..	J. Barsanti, Palmerston North	1 314	240·5	365	5,080·0	271·92
Zest of Bull's ..	F. J. Watson, Bull's..	1 357	240·5	324	4,156·2	245·45
Senior Two-year-old.						
Elza of O.K. ..	G. H. Bell, Oakura ..	2 346	275·1	365	9,236·1	501·15
Mystery's Butterfat..	J. F. Vosper, Matamata	2 343	274·8	365	7,404·9	480·52
Twylish's Daisy ..	F. J. Saxby, Hamilton	2 104	250·9	301	7,944·7	456·08
Oakvale's Hope ..	J. G. Short, Fitzroy..	2 357	276·2	350	7,253·5	393·36
Eringa Sybil ..	R. B. Godfrey, Pahiatua	2 346	275·1	352	7,319·2	367·51
Te Wiki Gloria ..	T. S. Edwardes, Tiakitahuna	2 176	258·1	302	4,911·4	326·66
Sabean Shepherdess..	T. S. Edwardes, Tiakitahuna	2 343	274·8	321	5,273·9	322·48
Allie's Coin ..	S. Atkinson, Papatoetoe	2 167	257·2	340	3,825·7	259·74
Three-year-old.						
Famous Jem ..	R. F. Wilkinson, Pukekohe	3 292	306·2	365	10,340·0	604·37
Dryad	J. F. James, Waitoa..	3 359	312·9	364	10,207·5	540·42
Vivandiere ..	A. Christie, Hikurangi	3 9	277·9	365	9,382·5	516·54
Madam Bushnora ..	F. J. Saxby, Hamilton	3 297	306·7	328	8,041·1	501·31
Dulcie of Bull's ..	P. J. Small, Kairanga	3 351	312·1	323	7,985·5	469·30
Miro's Necklace ..	E. R. Putt, Otakeho..	3 21	279·1	336	8,672·4	452·90
Fern Grove Malaprop's Lady	L. N. Faull, Tikorangi	3 300	307·0	267	7,425·75	439·23
Misnomer	B. Hey. Kaponga ..	3 330	311·0	336	7,594·75	432·69

RECORDS FOR OCTOBER, 1921—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days	Milk.	Fat.
	JERSEYS—*continued.*					
Three-year-old—contd.		Yrs. dys.	lb.		lb.	lb.
Zedda	T. S. Edwardes, Tiakitahuna	3 284	305·4	271	6,384·2	393·68
Dorothy Aster ..	C. Stevens, Maungatapere	3 320	309·0	358	7,061·9	375·34
Spec's Maid ..	J. Torbet, Waiau Pa..	3 18	278·8	254	5,068·7	320·62
Four-year-old.						
Cream of O.K. ..	T. Linn, Mangatoki ..	4 346	348·1	365	10,616·7	640·44
Waihinepai ..	E. Joyce, Kaponga ..	4 337	347·2	343	9,204·6	638·52
Exile's Katie ..	J. Hale, New Plymouth	4 315	345·0	365	10,050·4	614·05
Abbess's Countess ..	A. H. Guy, Mangatoki	4 14	314·9	342	9,167·1	576·12
Snowstorm's Primrose	L. K. Tarrant, Ngaere	4 339	347·4	358	9,895·5	544·76
Mountain View's Flora	H. C. Sampson, Hillsborough	4 355	349·0	365	9,230·3	533·79
Meg's Lady Hopeful	J. Fulton, Whangarata	4 184	331·9	365	9,116·2	526·43
Countess of Oakside	M. A. Gadsby, Stratford	4 19	315·4	365	8,411·5	521·27
Leinster	C. Stevens, Maungatapere	4 301	343·6	365	9,404·8	504·48
Huia's Glad Eye ..	H. J. Burrell, Bunnythorpe	4 344	347·9	365	8,496·2	465·69
Louisiana	C. Stevens, Maungatapere	4 276	341·1	365	8,951·7	454·25
Roslyn May Flower..	J. Harris, Bombay ..	4 322	345·7	351	8,031·9	424·12
Holly Bank T. Rose	A. B. Robertson, Hawera	4 349	348·4	346	6,073·8	422·72
Waitoa's Penelope ..	A. B. Robertson, Hawera	4 34	316·9	321	5,734·5	399·47
Bronze	D. L. A. Astbury, Mangatoki	4 305	344·0	365	6,991·5	397·31
Mussels	G. E. Cowling, Manaia	4 313	344·8	365	7,109·5	362·05
Fortune of O.K. ..	A. B. Robertson, Hawera	4 4	313·9	334	6,187·7	344·24
Tigredia	R. B. Godfrey, Pahiatua	4 21	315·6	300	7,693·7	320·58
Mature.						
Lady Bessie ..	A. H. Guy, Mangatoki	6 342	350·0	365	11,035·0	704·07
Peggy's Queen ..	J. Muir, Brixton ..	5 347	350·0	365	12,477·4	696·01
Agatha	C. Stevens, Maungatapere	6 338	350·0	353	11,587·5	669·02
Molina's Jess ..	G. H. Bell, Oakura ..	6 336	350·0	365	9,820·4	649·14
Charming Irene ..	C. Stevens, Maungatapere	5 242	350·0	358	10,396·8	591·48
Juniper Blue Belle ..	C. Stevens, Maungatapere	5 300	350·0	365	9,878·0	571·79
Yankee's Ruby ..	C. Jones, Manaia ..	6 358	350·0	365	8,934·1	553·73
Patch's Lily ..	R. C. Leach, Woodville	7 351	350·0	365	9,344·7	540·41
Loo	A. Christie, Hikurangi	7 17	350·0	338	9,793·0	527·91
Oleander	C. A. Care, Cambridge	9 43	350·0	365	11,208·5	522·71
Dudu	C. A. Care, Cambridge	9 337	350·0	354	9,604·7	504·45
Arrabelle	J. B. Clemow, Stratford	6 111	350·0	365	8,533·9	500·43
Clarita Maid ..	S. J. Bennett, Kaupokonui	8 231	350·0	365	9,432·0	497·95
Olga's Darling ..	A. Mouldey, Tirau ..	5 337	350·0	365	8,713·7	490·82
St. Lambert's Bossy	R. L. Horn, Manakau	6 262	350·0	365	8,793·25	478·39
Palmyra	C. Stevens, Maungatapere	6 303	350·0	365	8,341·2	473·10
Una's Fern Grove Queen	F. Ranford, Stratford	6 361	350·0	336	8,648·5	466·07

RECORDS FOR OCTOBER, 1921—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS—*continued.*				
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Roslyn Genoa Fancy	J. Harris, Bombay ..	6 262	350·0	365	9,832·2	456·44
Grand Lady ..	W. Mortlock, Normanby	6 22	350·0	365	7,275·6	449·88
Kilcoy	C. Stevens, Maungatapere	9 65	350·0	342	7,770·5	432·28
Amaranthus ..	E. P. Binns, Aorangi..	6 342	350·0	365	7,845·75	420·59
Lady Primrose Sultan	A. B. Robertson, Hawera	5 274	350·0	341	7,283·9	407·08
Rewa Anchusa ..	W. H. Booth, Carterton	9 99	350·0	280	7,990·0	401·99
Olive	E. Joyce, Kaponga ..	9 22	350·0	336	8,220·0	389·43
Dorothy Dainty ..	S. Atkinson, Papatoetoe	6 37	350·0	328	7,064·0	385·99
Bright Eyes of Beachlands	C. Parker, Hairini ..	7 29	350·0	276	6,937·9	369·06
Streamlet	H. J. Lancaster, Glen Oroua	6 153	350·0	234	6,283·6	365·81
Merry Queen ..	J. B. Clemow, Stratford	6 93	350·0	283	6,388·1	361·38
		MILKING SHORTHORNS.				
Junior Two-year-old.						
Peach Grove Lady Dinah II	W. J. Slack, Otaki Railway	2 180	258·5	365	9,458·8	430·74
Junior Three-year-old.						
Sweet Garnett II of Cornwall Park	R. S. Allan, Hatuma	3 15	278·5	365	8,808·7	288·46
Junior Four-year-old.						
Honesty IV of Cornwall Park	R. S. Allan, Hatuma..	4 19	315·4	356	10,845·3	392·53
Senior Four-year-old.						
Pukerimu Dolly XIV	J. Fisher, Cambridge	4 208	334·3	298	8,695·0	338·51
Mature.						
Studleigh Nancy Lee	D. Buick, Palmerston North	..	350·0	341	11,615·5	451·10
Hollie's Duchess ..	J. Bateman, Invercargill	..	350·0	365	10,975·15	445·34
Tamaki Princess ..	W. J. Slack, Otaki Railway	..	350·0	326	9,676·8	428·49
Willowmere Cassy ..	D. M. Holmes, jun., Pihama	..	350·0	334	11,389·0	395·30
Grassmere Florrie ..	S. G. Morgan, Ngawapurua	..	350·0	334	10,531·5	350·23
		AYRSHIRES.				
Junior Two-year-old.						
Young Gowan of Heather Dells	A. Weir, Waitara ..	2 40	244·5	305	5,355·75	252·58
		SECOND-CLASS CERTIFICATES.				
		JERSEYS.				
Junior Two-year-old.						
Bridgeview's Pet ..	A. L. Hooper, Stratford	1 316	240·5	365	7,722·1	522·81

THE GALL CHALCID OF BLUE-GUM.

A PRELIMINARY NOTE.

DAVID MILLER, F.E.S., Entomologist, Biology Section.

A CONSPICUOUS feature of many parts of the countryside is the dead or dying blue-gum (*Eucalyptus globulus*). The injury is commonly due to a gall insect, which Dr. L. O. Howard, Chief of the United States Bureau of Entomology, to whom specimens were sent, has kindly identified, and is describing as a new species of chalcid of the genus *Rhicnopeltella*. This insect occurs in most parts of New Zealand, but, as far as observations to date show, is most prevalent in the west-coast districts of the North Island, its depredations extending from Wellington to as far north as Awanui in the North Auckland Peninsula. In the South Island severe infestations occur in the east-coast districts throughout Canterbury to as far south as Oamaru.

The adult is a minute black insect which emerges during the summer months, when it may be found in large numbers on the bark of infested trees. Each of the small white grubs which cause all the damage lives in a cell on the sap-wood immediately beneath the bark, causing the latter to develop abnormally into a pimple-like swelling on the surface. When present in large numbers the bark assumes a gnarled appearance (Fig. 3), and the infested twig or branch soon dies. The tree endeavours to recover by throwing out new growth, but this is attacked by the grubs from the next brood of adults to emerge, and so on until the tree is completely killed. When fully grown the larva transforms to the pupa in the cell beneath the bark, from which the adult eventually escapes through a minute hole.

FIG. 1. ADULT GALL CHALCID, GREATLY ENLARGED.

The complete life-history of this insect is being worked out, and an endeavour is being made to locate some parasite by which the gall chalcid might be controlled. Inquiries made in Tasmania and Australia, whence the insect probably comes, show that so far it has not been recorded from those countries. It is therefore hoped that it does exist there, since, confining itself solely to *Eucalyptus globulus*, it may be so limited by the agency of some natural enemy as to be very inconspicuous, its presence on slightly infested trees being readily overlooked.

The gnarled appearance of the bark of blue-gums caused by infestation of the gall chalcid has been frequently mistaken for the gum-tree scale insect *Eriococcus coriaceous* Mask., but a comparison of Figs. 3 and 4 will show the distinction.

FIG. 2 (ON LEFT). BLUE-GUM TREE INFESTED AND ALMOST KILLED BY THE GALL CHALCID.
FIG. 3 (CENTRE). PORTION OF BLUE-GUM BRANCH, SHOWING GALL CHALCID INFESTATION.
FIG. 4. GUM-TREE SCALE (ERIOCOCCUS CORIACEOUS)—TO BE DISTINGUISHED FROM THE GALL CHALCID.

FARM HEDGES.

W. H. TAYLOR, Horticulturist.

THE importance of good shelter-hedges is so well understood that it requires no recapitulation. The subject of hedges themselves is worthy of consideration, however, not only for the benefit of farms in the making and those yet to come, but also because the outbreak of the fireblight disease may render it necessary to replace many hedges already established. The hawthorn has been very extensively planted, particularly in the North, and, whatever may be the fate of the existing hedges, no more will be planted, this being now prohibited under the Noxious Weeds Act.

The question then arises, What kind of hedge is likely to be adopted? Observation and a considerable volume of correspondence dealt with by the writer show that a hedge that requires much trimming will not find general favour. The hawthorn hedges referred to are in most cases untrimmed, the trees being left to grow their own way. This means that they are not hedges in the proper sense, but rather should be termed wind-breaks, and it appears that the question should be approached with this consideration in mind. It is extremely improbable that much labour will be expended in the maintenance of hedges, and, except in the case of comparatively short lengths such as for subdividing home paddocks, it would be futile to use plants that demand regular trimming. In this article shelter-belts will not be dealt with any further than to say that in many cases a narrow belt would be a better investment than a single line of trees—a so-called hedge. There are, presumably, two chief reasons for planting a single line—namely, economy in cost of establishment and in space of land occupied. The hawthorn met these requirements very well. It is here proposed to deal with such plants as come nearest to the hawthorn in these respects, and also to refer to those that make good hedges in the proper sense. It may be premised that a certain amount of trimming is needed in every case.

SOME HEDGES AND THEIR ESTABLISHMENT.

Chinese Privet (Ligustrum sinense).—The Chinese privet is an evergreen, a very strong and rapid grower, and makes a small tree 18 ft. to 20 ft. high. It is as much at home in localities of dry climate and poor land as in a moist climate and rich soil. Subject to no disease or special insect pest, this plant should do well everywhere. A cattle-proof fence can be made by planting in double row in quincunx order, plants in each row 30 in. apart and rows 12 in. apart. Side trimming should be practised for the first few years so as to thicken growth. The tops may be merely tipped or not touched at all, this to be judged by length of growth. If it is left untrimmed, later on the plant would in general form of growth approach more nearly to the hawthorn than any other plant I know suitable for the purpose, unless it be the cherry-plum. A great advantage with this privet is that new growths appear wherever a branch has been cut

back, and it can be cut back to any extent. The whole hedge might be cut to near the ground, and it would again make good growth. A certain amount of trimming or shortening-back of branches is at times necessary to maintain a close breakwind. The plant is raised by cuttings, and transplanted without trouble or risk of losses.

Lawson's Cypress (Chamaecyparis (Cupressus) Lawsoniana).—For making an evergreen hedge or breakwind this cypress is probably not excelled except by one other tree, the yew (*Taxus baccata*), which need not be considered, as it is too slow in growth for the purpose, and is poisonous to cattle. The Lawsoniana, as it is commonly called, will make an excellent hedge of small dimensions, a large hedge, or merely a breakwind, which means that it will bear the cutting necessary to restrict spread, and also close planting. Cutting-back must not be to bare limbs; they will not break. There must be always growth behind the cut, which implies the necessity for frequent attention if restricted spread is desired. It stands wind better than do gum-trees, and is not particular as to soil, provided there is a fair depth to root in. Restriction of growth is necessary, for if left to grow naturally the trees would occupy too much space. Clipping by shears is not good practice, nor is trimming with a slasher. Pruning by knife or seccateurs is the proper method; a billhook can be used for topping. It is raised from seeds, and is rather slow growing as a seedling. The young trees are never likely to be very low in price. Plant 3 ft. apart.

Cherry-plum (Prunus cerasifera).—This is the well-known cherry-plum or myrobalan. In it we have a tree that will make a cattle-proof fence in a short time and with small cost in attention. Cuttings strike quite freely. They should be raised in a nurse-bed, and planted in the autumn or spring following. Plant 18 in. apart. The young plants should not be severely pruned; merely cut back straggling shoots and reduce the tops so as to make a shapely plant. During the first season allow the plants to grow without any trimming; the more growth they make the better. Towards the end of the next winter, before new growth begins, the plants should be cut down to within 6 in. of the ground, which is easily done with a slasher. A number of strong shoots will be made as a result of cutting back, which will give the hedge a very strong base. I have known this to result in a sheep-proof hedge by the end of the season. Growths are strong, and furnished with strong spines. There need be no hesitation to apply this treatment. A cut-back hedge will at the end of a year be much larger than a hedge not so treated. It may be asked, Why not cut the plants down when they are planted? That would not do at all; the result would be weak growth. It is necessary to establish a good root-system before cutting down. This is the method by which the fine hawthorn hedges seen in the Old Country are established, except that they are allowed to grow for two years before being cut down. Any future trimming (and a first-class hedge or breakwind requires it) can be easily done with a slasher. The cherry-plum shows the same adaptability to soil and climate as does the Chinese privet.

Boxthorn (Lycium horridum).—There is no question about boxthorn making a good hedge; it can be made quite cattle-proof by the same cutting-down as detailed for the cherry-plum. There are, however,

some disadvantages connected with boxthorn that should be mentioned. It is an exceedingly spiny plant, and the spines cause poisoned wounds that are difficult to heal. When trimming it the hands of a workman must be protected by good leather gloves. All trimmings must be cleared up, for the spines injure the hoofs and fetlocks of animals. In addition to this, trimming is rather difficult work unless done frequently. The wood is hard, and it is an awkward hedge for a slasher. If after the hedge has been well established it is allowed to run it will make a good breakwind about 15 ft. high. An untrimmed hedge, however, will fruit freely, and if the plants spread to waste or hilly land it becomes a very serious pest. The usefulness of the boxthorn hedge to the Taranaki dairy-farmer has to be seen to be properly appreciated. Boxthorn is extensively planted in many parts of Australia, particularly Victoria and South Australia, where it makes a magnificent hedge. The main argument against this plant in Australia arises from its spreading habit, in consequence of which the plant, over some areas, has been declared a noxious weed other than when in the form of a well-trimmed hedge. Very strenuous efforts are being made to get the law altered so as to secure the complete eradication of the plant, and it appears likely that this will eventuate. In these circumstances it appears to me that while the boxthorn makes an excellent hedge, even in poor soil where many plants would not succeed, and is well adapted for use as a hedge where it can be kept trimmed, it would be unwise to plant it where the extent of hedges would preclude proper trimming. If used, plant 18 in. apart. It is raised from seeds; plants are low in price. The resisting property of boxthorn to strong, salty winds off the sea is a point in its favour which should be noted.

Lombardy Poplar (Populus fastigiata).—The upright poplar is largely used for shelter purposes, particularly in Hawke's Bay. Here may be seen trees of giant size, and in other cases, where planted closely (sometimes 2 ft. apart), tall and narrow wind-breaks. This tree can be easily raised from cuttings, which may be small or large. In good and fairly moist soil cuttings 6 ft. to 8 ft. long may be used. Make the holes with a crowbar, let the foot of the cutting rest on the bottom of the hole, and tamp the soil firm around it. After a line of cuttings has been put in the tops should be cut off to one level. It is bad practice to drive cuttings in with a mallet, as is often done; the bark at the foot is torn off, and the cutting roots feebly from higher up. Where very dry summers are experienced cuttings are not reliable, and rooted trees should be planted. One of the best breakwinds I have seen is a double row of poplars, the rows 4 ft. and trees 2 ft. 6 in. apart, with *Elaeagnus japonica* planted in the middle. The Elaeagnus climbed the poplars and required no clipping. An advantage of poplars is that the wood being very soft it costs little to top them now and again when they exceed the desired height. There is an idea prevalent that the poplar suckers badly, but that does not apply to the Lombardy poplar.

Macrocarpa Cypress (Cupressus macrocarpa).—It appears to be necessary to mention this tree, though personally I have always been opposed to its use as a hedge. Because young trees are comparatively cheap and it is a fast grower it has been extensively planted in hedges.

The two qualifications mentioned are all that is in its favour; everything else is against it. It is expensive to clip, as this must be done with shears, and clipping must be frequent or the hedge will cover too much space. It dies out under constant clipping, although dying may be deferred for a good many years. It is practically impossible to fill gaps where trees die. The expense of maintenance should condemn it even if it were permanent. If left unclipped it not only covers an inordinate amount of space, but eventually becomes bare at the bottom, when a draught is created that is worse than no shelter at all. In brief, the macrocarpa cypress is a very valuable tree in its proper place —which is not as a hedge.

Osage Orange (Maclura aurantiaca).—This makes an excellent hedge up to about 15 ft. in height. It bears cutting to any extent; hedges reduced in height and cut back to the bare trunks break again quite freely. It is suitable for the warmer districts only. Raising is done from pips.

Common Barberry (Berberis vulgaris).—This is a great favourite with farmers; it makes a cattle-proof hedge with little attention. Plant in double row in quincunx order, 30 in. apart in each row, rows 12 in. apart. Easily raised from seed, it is one of the cheapest plants. It is necessary to mention that in some districts—Taranaki in particular —the barberry is spreading to hilly land by birds carrying the seeds. On this account barberry is now included in the Third Schedule of the Noxious Weeds Act—that is, the local body may declare the plant a noxious weed. In Taranaki it is now allowed only where regularly clipped to restrict fruit-bearing, and it is liable to be declared in other districts.

Elaeagnus japonica.—No plant makes a stronger hedge than this, though it is not a lofty one. It must be planted in a double row as detailed for the barberry. A single row will not stand, as the plant does not make a strong trunk. Its disadvantage is that the trimming is expensive. This cannot be done with a slasher, and the operation must be frequent. The hedge should be clipped twice a year; one clipping would be more expensive than would two. This bars its use except for comparatively short lengths of hedge, but for that purpose it is excellent. It would be useless to plant Elaeagnus unless with the intention of clipping, for naturally it is of a sprawling, semi-scandent habit, and it would not stand up. It is not easy to think of any other plant that would be generally adaptable as a short farm hedge in various parts of the Dominion, and certainly none equal to those already mentioned

Other Hedges.—Some of the *Pittosporum* species make nice hedges, but not cattle-proof. *Olearia Forsteri* makes a splendid hedge in some places, and fails in many others. This plant is subject to attack by a gall-insect, *Cecidomya olearia*, closely related to the Hessian fly. When growing in poor soil or in a dry climate or situation the attacks of this gall-insect stunt growth to such an extent that the hedge is made useless. In a climate that suits it holly makes a very fine hedge, but in the warmer districts it is worthless. It becomes a prey for *Lecanium* scales that cover the leaves with honeydew, which in turn becomes covered with a black fungus, choking the pores and starving the plant

Preparing the Site and Planting.

The ground should be broken up some time before planting the hedge, so as to allow time for the soil to sweeten, and all clods should be well broken up. A fair depth of rooting-medium is necessary and should be provided. Where the subsoil is naturally loose it will be sufficient to break up the surface soil, but where the subsoil is clayey or hard a narrow strip deeply worked may become merely a trench filled with water. This can be prevented by throwing up soil from the side, which will raise the surface and obviate the necessity for deep working, and at the same time form a water-table to carry surplus water. When planting, strike the spade down perpendicularly where the first plant is to stand, throwing the soil forward. Place the roots against the perpendicular wall thus formed, dig soil up to it, and tread firm. Then dig towards the plant to a little beyond the site for the next plant. Strike the spade down again, dragging the soil back to leave another perpendicular wall, and so on throughout the planting. This is the quick and safe method. Any attempt to spread roots will not only delay the work of planting, but will also tend to increase the proportion of losses.

It is necessary to protect a young hedge from sheep and cattle by double fencing or otherwise. I have not seen the plant that sheep will not eat, and cattle will often eat a plant when it is young that they will not touch when well grown. In any case, cattle would trample young plants down and tramp the soil hard, and this should be kept loose and free of weeds for at least two years.

WOOL-HANDLING REMINDERS.

The proper time to prepare wool for market is while the shearing is in progress. The fleece must be skirted—that is, any part on the outer edges which does not harmonize with its general appearance should be torn off and put into its respective class. Then the fleece is lapped and rolled, the object being to make it more convenient for handling afterwards. After rolling comes classing. This consists in sorting the fleeces, according to quality, condition, length, and soundness, into the classes or grades in which they harmonize with each other. When this skirting and classing are properly done the line will be uniform throughout, and will give a higher percentage of clean yield when scoured. The result will be very apparent in the degree of competition between the buyers when the wool is put up at sale-time.

If a farmer has only enough fleeces to make a light-weight bale he should skirt the fleeces and when classing make two lines. Put all the finer fibre fleeces into one bin and the coarser fibre fleeces into another bin. When pressing, put the coarse fleeces at the bottom of the bale, then place a piece of bagging on top of them. Next put in the fine fibre fleeces, and sew the cap on the bale. When branding the bale, make a black line round two sides of the bale at the point where the division comes between the two wools. In the wool-room the bale will be opened at both ends, and also a cut can be made where the black line is drawn. By this means the buyer can see at a glance how much there is of each line, and it gives him a better chance to make his valuation than if both lots had been put in as one line.

Full particulars regarding the preparation of wool for sale, &c., were given in the *Journal* for November, January, and March last.

—*J. G. Cook, Wool Instructor.*

GORE EXPERIMENTAL AREA.

OPERATIONS IN SEASON 1920–21.

R. B. TENNENT, N.D.D., Instructor in Agriculture, Dunedin.

SECTION I.—INVESTIGATION OF SWEDE DRY-ROT.

THE work carried out during the last season on this section has been a further investigation of such preventive measures as were likely to prove effective in the elimination of the disease *Phoma napobrassicae*, generally designated as dry-rot of swedes. This special investigational work has been conducted by the Biology Section, and reports on some of the data obtained therefrom have appeared at different times in the *Journal*.* While not proposing to elaborate on the results of the experiments, the trials which have taken place on this section—each of which has been the outcome of information and observations obtained from investigations during preceding years—may be briefly outlined as follows :—

(1) Soil-sterilization methods ; (2) thinning the bulbs to different distances apart in the drills, and various rates of seeding ; (3) spraying trials in which various sprays of different concentration were applied ; (4) sowing on different dates ; (5) manurial trials ; (6) variety trials.

The object in attempting to sterilize the soil lay in the possibility of destroying or rendering innocuous by this treatment the organism responsible for the disease, indications having been obtained from previous experiments that the causative agent had its abode in the soil. It was hoped that soil-sterilization would thus prove a decided controlling factor of the disease, and that the results obtained therefrom would present some practical and effective method of overcoming it. The method of sterilization carried out on various plots consisted in the use of the following reagents applied to the soil : Burnt lime (in various quantities), sulphur, copper sulphate, iron sulphate, formalin, carbon bisulphide, bordeaux mixture.

The other trials are self-explanatory — that is, various rates of seeding, different dates of sowing, thinning out the bulbs to predetermined distances, spraying the crop with bordeaux at different periods of the crop's growth, the effect of various organic fertilizers in stimulating or retarding the disease, and the sowing of a considerable number of different varieties of swedes with a view to obtaining one variety which might show a decided resistance to dry-rot.

The sowing, with the exception of Series 5, was undertaken on 29th and 30th November, 1920, and the resultant crop in its initial stage was a decided success. Later on in the season, however, dry-rot began to appear, and ample opportunity was afforded to witness the effect of the various preventive measures which were receiving trial. The fertilizers, unless where specially arranged, consisted of a

* Another article dealing specially with the swede dry-rot investigation will appear in the *Journal* later.—EDITOR.

mixture of superphosphate (3 parts), Calcutta ground bones (2 parts), and carbonate of lime (1 part), applied at the rate of 3 cwt. per acre.

SECTION 2.—SOFT TURNIPS.

The object of this trial was to ascertain the respective values of six popular varieties of soft turnips tested under exactly similar conditions. The determining factors from which their value was deduced were based on the yield per acre, palatability to stock, and keeping-qualities. During the season of 1919–20 a similar experiment was carried out, and the object last season was to substantiate the earlier results. Sowing was on 6th and 9th December. The fertilizer consisted of a mixture of 3 parts superphosphate, 2 parts ground Calcutta bones, and 1 part carbonate of lime, applied at the rate of 3 cwt. per acre. The varieties grown were the same as last year, and the total yields (roots and tops) for the two seasons are shown in the following table :—

Plot.	Variety.	Yield, 1920.	Yield, 1921.
		Tons.	Tons.
1	Garton's Hardy Green Globe..	31·29	32·65
2	Garton's Mammoth Purple-top	32·11	39·75
3	Garton's Lincoln Red Globe	33·93	45·40
4	Garton's Purple-top Scotch	22·84	33·66
5	Garton's Green-top Scotch	20·83	28·76
6	Garton's Deep Golden Yellow Long-keeping ..	19·03	27·70

The past season's crop was excellent, and on account of more favourable climatic conditions the average yield was higher than that obtained in 1920. A decided increase in the yield of Lincoln Red Globe is to be observed, and represents the record yield obtained on this area.

Palatability : Arrangements were made to have the whole crop fed off on the area. The results were practically the same as recorded for the preceding year. From careful observations made when the sheep were turned on to the turnips the palatability of the several varieties is classed as follows : (1) Deep Golden Yellow Long-keeping, (2) Hardy Green Globe, (3) Green-top Scotch, (4) Purple-top Scotch, (5) Lincoln Red Globe, (6) Mammoth Purple-top.

Keeping-qualities : A slight variation from the previous year's results is recorded, in that Garton's Deep Golden Yellow remained crisp and sound for the longest period. The final observations were made on 25th August, when the various plots were placed in order of keeping-qualities as follows : (1) Deep Golden Yellow Long-keeping, (2) Purple-top Scotch, (3) Green-top Scotch, (4) Hardy Green Globe, (5) Mammoth Purple-top, (6) Lincoln Red Globe. At the date of recording results the three last-named varieties were comparatively useless, having run to seed, the bulbs being spongy and of low feeding-value. There can be no doubt that these varieties should be chiefly utilized for early feeding, and provided they are sown in ample time they could be fed off as early as March. The Purple-top and Green-top Scotch were in very good condition, there being little indication of running to seed, although the bulbs were beginning to become pithy.

The Deep Golden Yellows were quite good, and were readily eaten on stock being given access to the area.

Summary: The general trend of results obtained both last year and this year points clearly to the fact that Lincoln Red, Mammoth Purple-top, and to a lesser extent Hardy Green Globe should all be grown for early feeding. Sown early enough to allow of their coming in for late summer or early winter feed they would be very profitable, but to hold over for late feeding they are quite useless when compared with the other varieties of the test.

SECTION 3.—NEW OAT VARIETIES.

A trial was carried out comprising seven varieties of Webb's new oats and one variety of Garton's, the object being to ascertain which would prove the most productive under Southland conditions. The plots were sown down on 23rd October at the rate of 4 bushels, and basic superphosphate was applied at the rate of 3 cwt. per acre. The following results per acre were obtained: Plot 1, Webb's Prolific Black Tartarian, 30⅔ bushels; plot 2, Webb's New Market White, 26⅔ bushels; plot 3, Webb's New Hardy Winter Black, 42⅔ bushels; plot 4, Webb's Challenge White Canadian, 26⅔ bushels; plot 5, Garton's Tartar King, 34⅔ bushels; plot 6, Webb's Sable White King, 37⅓ bushels; plot 7, Webb's Grey Winter, 26⅔ bushels; plot 8, Webb's White Horse, 32 bushels.

The seed from these plots has been reserved for further trials, and will be retained for pedigree-seed lines.

SECTION 4.—WINTER FORAGE CROPS.

The object of this trial was to determine the carrying-capacity and to ascertain the relative feeding-value of certain winter forage crops in relation to swedes. In regard to production, excellent results were obtained. The plots were ridged on 19th November, and a manurial mixture applied of superphosphate, 2 cwt.; Calcutta bones, 1 cwt.; and carbonate of lime, 1 cwt., per acre. The following yields were recorded: Plot 1, kohlrabi (seeding 2 lb. per acre), 14 tons 6 cwt.; plot 2, chou moellier (2 lb. per acre), 24 tons 2 cwt.; plot 3, Superlative swede (3 lb. per acre), 27 tons 11 cwt.; plot 4, field-cabbage (1 lb. per acre), 19 tons 10 cwt.; plot 5, Thousand-headed kale (3 lb. per acre), 20 tons 4 cwt.

There were no poor crops in the forages tested, as will be seen from the yields per acre. Although the germination of the kohlrabi was not so good as that of the other crops, the seed which did germinate made excellent growth, and the result shown indicates only about 75 per cent. of what one might normally expect.

On 15th June each of the plots in this section was fenced, and sheep put on with a view to ascertaining the amount of grazing which each individual plot could stand. The results, which are instructive, are as follows, the size of the plots being in all cases three chains by one chain: Plot 1, kohlrabi, carried thirty sheep for eighteen days; plot 2, chou moellier, thirty sheep for twenty days, and then eighty-five sheep for one day to clean up the area; plot 3, Superlative swedes, thirty sheep for twenty days, and then eighty-five sheep for four days to clean up;

plot 4, field-cabbage, thirty sheep for eighteen days, and then sixty sheep for one day; plot 5, Thousand-headed kale, twenty sheep for twenty days, and then eighty-five sheep for one day.

The sheep on the kohlrabi plot did not improve very much during their grazing-period, but considerable improvement was noticed in the sheep grazed on the cabbage and chou moellier plots. The Thousand-headed kale was not relished to the extent that one might have expected, and a certain amount of scouring took place, this no doubt being accounted for by the fact that prior to the sheep being turned on to the plot they had been grazing on poor, dry pastures. The swede plot had the greatest carrying-capacity, but, so far as appearances

CHOU MOELLIER AT GORE EXPERIMENTAL AREA.

went, it did not prove equal to the cabbage or chou moellier for putting on condition.

The conclusions arrived at in the test place the various forages in the following order in so far as feeding-value is concerned: (1) Chou moellier; (2) cabbage; (3) swedes; (4) Thousand-headed kale; (5) kohlrabi. It is proposed to repeat this experiment during the 1921–22 season's operations, in order that confirmation or otherwise of these results may be obtained.

SECTION 5.—CLUB-ROOT INVESTIGATION.

This section was known to be badly infested with club-root (*Plasmidophora brassicae*). To test the efficacy of lime for controlling the disease the section was divided into five equal strips running north and south, and treated with the following applications of burnt lime

per acre: Plot 1, 2 tons; plot 2, 16 tons; plot 3, control (no lime); plot 4, 8 tons; plot 5, 4 tons. Observations are being made by the Biology Section.

The section was then divided into four strips running across the limed strips, and was sown down in the following crops: (1) Garton's Superlative swede; (2) short-rotation grass-mixture; (3) legume crop —red and crimson clover; (4) cereal and legume crop —oats and tares. These four crops represent what might be termed farm practices, in that each is typical of what could easily be arranged on an average farm. In them are swedes following swedes on club-root ground (the whole of this section was in swedes last year); then a club-root area sown down in short-rotation pasture; again, the same ground sown down to a pure legume crop, which is designed to last two years; and, lastly, a special hay or ensilage crop of cereals and legumes. The final working-out of this scheme will, of course, take some considerable time, as it is intended to determine a system whereby it will be either possible to control club-root by starvation, or arrange a rotation of crops to ensure avoiding it. At date of writing the observation of results regarding club-root is not completed.

It is of interest to record the results of lime in various quantities applied to the short-rotation pasture (2), which was laid down with Italian rye-grass, as follows: Plot 1, with 2 tons of burnt lime, yielded 4 tons 7 cwt.; plot 2, 16 tons burnt lime, 5 tons 7 cwt.; plot 3 (control), no lime, 2 tons 10 cwt.; plot 4, 8 tons burnt lime, 4 tons 14 cwt.; plot 5, 4 tons burnt lime, 3 tons 9 cwt.

In regard to plot 5, a piece of clay ground upon which the grass-seed had not germinated well accounted for the low yield.

SECTION 6.—HAY AND SMOTHER CROPS.

Plot A of this section has been devoted to the production of autumn-sown cereals and legumes grown with the object of producing a crop that would not only be valuable for hay or ensilage purposes, but would have the additional advantage of acting as a smother-crop during the early spring on land infested with Californian thistle, thus effectively controlling that weed.

During the course of the operations the various crops were weighed both in the green and cured condition. This information is of value in that it shows the shrinkage which actually occurs between the time of cutting and stacking. The soil conditions on this section were very even and did not favour any particular crop. The greatest variation arose in the matter of cutting and the climatic conditions obtaining at the time. The first crops ready for cutting were rye-corn and tares, oats and tares, and barley and tares, these being cut just a fortnight earlier than the wheat and tares, and Western Wolths rye-grass and clovers. The first crops cut were saved in quite good condition, while those last cut were considerably damaged by rough weather. For these reasons the figures given below can scarcely be accepted as definite, but are recorded as follows:—

Plot 1, rye-corn and tares, yielded 5 tons 8 cwt. green weight, or 2 tons 16 cwt. hay weight; plot 2, oats and tares, yielded 5 tons 9 cwt. green weight, or 2 tons 13 cwt. hay weight; plot 3, barley and tares, yielded 1 ton 19 cwt. green weight, or 1 ton 4 cwt. hay weight; plot 4,

wheat and tares, 5 tons 3 cwt. green weight, or 2 tons 11 cwt. hay weight; plot 5, Western Wolths rye-grass and red clover, 1 ton 3 cwt. green weight, or 7 cwt. hay weight.

Plot B of this section was sown down in crops designed purely for smothering purposes. The crops and dry weights yielded per acre are as follows: Plot 1, Weraroa vetchling and rye-corn, 2 tons 10 cwt.; plot 2, *Lathyrus Tingitanus* and rye-corn, 1 ton 18 cwt.; plot 3, Scotch tares and rye-corn, 3 tons 5 cwt.; plot 4, Moumahaki vetch and rye-corn, 2 tons 9 cwt.; plot 5, black purple vetch and rye-corn, 2 tons 2 cwt.; plot 6A, *Lathyrus Ochrus* and rye-corn, 1 ton 18 cwt.; plot 6B, partridge pea, 3 tons.

As will be seen from these weights, there were one or two quite good plots, while others were poor. The variation of weights shown more or less represents the quantity of legumes present in the crops. The absence of a legume in the case of plot 6A was specially noticeable, while plot 3 was fairly thickly sown with the legume.

SECTION 7.—GRASS-PLOTS.

This section had been previously laid down in pure plots of cocksfoot, timothy, crested dogstail, and prairie-grass. In November, 1920, pure sowings of meadow-foxtail, meadow-fescue, and Poa trivialis were added. The individual plots are on the small side to allow for separate stocking, and are reserved to obtain any available information in regard to palatability, habit, and tenacity of these pure grasses. The importance of gaining such information, coupled with the limited area at our disposal, has necessitated the transference of this experiment to the Winton Experimental Area, where most of the pasture and grass experiments for Southland will in future be carried out.

SECTION 8.—LUCERNE.

While it is recognized that the Gore district is not ideally suited to lucerne-cultivation, the fact remains that successful crops of that fodder have been grown in similar localities, and it was with a view to ascertaining the possibilities of the crop in Southland that this trial was initiated. The demand for information on the subject of lucerne-cultivation has been considerable in the South, the farmers evidently realizing the economy of feeding hay with their root crops, and viewing the possibility of securing green succulent fodder during the drier months of January and February. Therefore the decision to test this fodder met with general encouragement, the intention being to endeavour to demonstrate, by all reasonable means, lucerne-growing as a profitable undertaking to the farmers of south Otago and Southland.

The land selected for the purpose might well be called second-class agricultural land, and is of a heavy nature with a fairly stiff subsoil. This type of land is, of course, not ideally suited to lucerne-cultivation, but is fairly representative of the general class of land upon which the average farmer of the district would be more or less forced to grow lucerne, should he decide to do so.

The area was limed in October with a dressing of 2 tons per acre of burnt lime. The cultivator had been kept going regularly, with a result that the land was free from weeds and in good tilth by sowing-time. The seed was sown on 1st and 2nd December by means of

a Planet Jr. seeder, in rows 21 in. apart. No fertilizer was applied. The main seeding was Marlborough variety, but in addition one and a half drills of Grimm seed were also sown. A number of young plants of Grimm were planted out to complete the half-row where the seed stopped. Inoculated soil was spread at the rate of 300 lb. per acre immediately after sowing the seed, and the whole area then chain-harrowed.

As a result of this sowing a good strike was obtained, and the young plants came away healthy and vigorous. Weeds proved slightly troublesome, but were kept in check by frequent intercultivation. Growth continued steadily throughout the season, but for practical purposes no hay crop was obtained. By winter the plants had attained a good, strong, robust condition, and at the time of writing (October) the lucerne is looking exceptionally well. While not wishing

THE LUCERNE STAND AT GORE EXPERIMENTAL AREA.

to be too optimistic, I feel confident that during the 1921–22 season the crop will do remarkably well. It is intended to test the lucerne in comparison with other forage and hay crops with a view to determining its comparative value.

SECTION 9.—POTATOES.

Subsection A.—Investigation into Powdery Scab.

This investigation is undergoing its preliminary stages, and is being supervised by the Biology Section. The experiments are designed to give information on the following points: (1) Effect on resultant crop when seed known to be infected with powdery scab is used; (2) combative measures to adopt for control of infected seed; and (3) limiting effect of powdery scab in relation to yield per acre.

A similar trial was carried out on the Winton Area (as described in last month's *Journal*), and a comparison with the results obtained is of interest, the details being as follows :—

Plot No.	Seed Tubers.	Treatment of Soil and Seed.	Yield.	
			Gore Area.	Winton Area.
			lb.	lb.
1	Scabby ..	No lime	25	36
2	,, ..	3 tons crushed lime per acre ..	31	30
3	,, ..	Corrosive sublimate ; no lime ..	81	156
4	,, ..	Corrosive sublimate ; 3 tons limestone per acre	35	84
5	,, ..	Formalin ; no lime	49	74
6	,, ..	Formalin ; 3 tons limestone per acre	43	120
7	Clean medium	No lime	128	236
8	,,	3 tons limestone per acre.. ..	54	126

It is interesting and significant to note, however, that at the date of lifting the tubers no potatoes infected with powdery scab could be found, and this also appears to have been the case in the same season's trials on both the Winton and Ashburton Experimental Areas.

Subsection B.—Origin of Seed Trial.

This investigation was made with the object of securing definite information regarding the effect on yield of planting seed grown in different districts of the Dominion. Two varieties were tried out, seed of these being procured from different localities. The following is a summary of the results obtained :—

Plot No.	Variety.	Origin of Seed.	Yield.
			lb.
1	Arran Chief	Southland	280
2	,, ...	Canterbury	290
3	,, ...	Pukekohe	128
4	Gamekeeper	Southland	217
5	,, ...	Canterbury	201
6	,, ...	Palmerston North	285

Subsection C.—Size and Form of Seed Trial.

This trial was initiated with a view to obtaining some information as to which is the best end of the seed and the correct size of seed to plant. Arran Chief variety was used throughout, and the following results were obtained :—

Plot No.	Size and Method of Planting.	Yield.			
		Table.	Seed.	Small.	Total.
		lb.	lb.	lb.	lb.
1	Very small	53	132	105	290
2	Medium size	94	191	135	420
3	Table size, uncut	67	131	108	306
4	Table size, cut	8	16	4	28
5	Stem end planted	113	145	85	343
6	Rose end planted	153	116	59	328
7	Medium size	103	160	67	330

Subsection D.—Variety Trial.

In this, as in all the preceding potato trials, planting was carried out on 17th November, a mixture of equal parts of superphosphate, Calcutta bones, blood-and-bone, and carbonate of lime being applied at the rate of 4 cwt. per acre. The following are the results :—

Plot No.	Variety.	Number of Rows.	Yield.			
			Table.	Seed.	Small.	Total.
			lb.	lb.	lb.	lb.
1	Russet	4	118	167	63	348
2	Gold Coin	3	72	102	35	209
3	New Era	4	129	210	53	392
4	Dakota Red	4	89	118	42	249
5	Manhattan	3	22	60	35	117
6	Breeze's Prolific ..	4	47	87	66	200
7	Up-to-Date	3	16	58	56	130
8	British Queen ..	4	22	114	79	215
9	Arran Chief	4	51	142	97	290
10	Snow Flake	4	152	43	17	214
11	Snow Drop	4	35	168	109	312
12	Robin Adair ..	4	71	81	26	178
13	Maori Chief	4	90	130	73	293
14	White Queen ..	4	32	37	34	103
15	Sir J. G. Wilson ..	4	266	158	74	498

SECTION 10.—LINSEED.

This section of approximately 1½ acres was new ground ploughed out of tussock for the first time. Owing to its being nearly all a back-lying face it is not particularly suited for experimental or small-plot work. The linseed was sown on 27th October at the rate of 60 lb. per acre, and manured with 3 cwt. per acre of basic superphosphate. A particularly light crop resulted, this no doubt being accounted for by the poor land, late sowing, and dry season.

The work on the area during the season was ably carried out by Mr. T. Pattinson, Overseer. Mr. W. Alexander, Fields Instructor, Invercargill, has been responsible for the direct supervision of the experiments and investigations.

Hawthorn and Fireblight.—Further Auckland suburban local bodies—the Mount Albert Borough Council and the Ellerslie Town Board—have declared hawthorn to be a noxious weed in the districts under their jurisdiction.

Weraroa Sale of Pedigree Cattle.—The Central Development Farm held its annual sale of pedigree cattle on 19th October. Buyers from both the North and South Islands were in attendance, and there was good competition throughout. Twenty lots of Friesian bulls averaged £37 14s. 6d., the highest price being paid for Dominion de Kol Clothilde, at 100 guineas. Friesian females (fourteen lots sold) realized an average of £66 0s. 8d., the top price being for Dominion Segis Mercedes, at 100 guineas. Red Poll bulls (six lots) averaged £38 1s. 3d., Dominion Major Longford, at 51 guineas, bringing the highest figure. One Guernsey bull (the only lot of this breed) was disposed of for 40 guineas. The sale receipts totalled £1,949 6s. 6d.

PHORMIUM TENAX.

THE NEW ZEALAND FIBRE INDUSTRY.

ESMOND H. ATKINSON, Biological Laboratory, Wellington.

VI. DISEASES AND INSECT PESTS.

YELLOW-LEAF.

THE most important of the diseases which have hitherto attacked phormium is that now generally known as "yellow-leaf." A plant attacked by this disease first becomes conspicuous from the bright-yellow colour of some or all of its leaves. It is true that yellow leaves may be seen on healthy plants, but in this case only the oldest leaves at the outside of the fan are so coloured, yellow being the colour first assumed in the course of the natural decay of an old leaf. In a diseased plant young and old leaves are equally liable to a change in colour. There is, however, no sharp line of distinction as regards general appearance between healthy plants and those in the incipient stage of yellow-leaf; in the later stages the leaves become brown and shrivel up, and a closer examination will show in many cases that a number or all of the roots are dead and the rootstock decayed.

A preliminary study of the disease, extending over a period of fourteen months, has been carried out by Dr. L. Cockayne, F.R.S. The time covered by the investigation was admittedly not long enough for a complete study to be made, so that some of the conclusions arrived at may need modification. A number of plants, both healthy and otherwise, were marked, and the progress of the disease in them noted. The conclusion was arrived at that yellow-leaf is an infectious disease, probably due to fungal or bacterial attack, which is aggravated by the presence of stagnant water around the plant, and which would to a large extent be remedied by draining the swamps better in winter and keeping them moister in summer. From the marked plants above referred to it was seen that recovery, even in badly affected cases, was not infrequent. Improvement was most noticeable in autumn and winter, followed by deterioration in spring and summer, the latter season being the period when the disease is at its worst.

The extension of the rootstock of a diseased plant on to more favourable ground is almost always followed by an improvement in the general health of the plant.* Very few plants are killed outright, and those that have recovered are capable of producing leaf in no way inferior to that from plants that have remained uniformly healthy. The frequent occurrence of plants which, although surrounded by diseased ones, remained healthy over a long period suggests that certain races are immune, and the cultivation of such forms would undoubtedly be one of the most effective ways of dealing with yellow-leaf.

A fungus from the roots of affected plants, in the tissues of which it was fructifying, has been isolated and cultured by Mr. R. Waters, of the Biological Laboratory, and was identified at Kew as a species

*Mr. A. Seifert, however, writes as follows: "I took some phormium roots suffering rather badly with the disease from the Makerua area, and planted them in my garden at Palmerston North. For a while the plants appeared to recover, but later took the disease again and died. Mr. R. T. Bell had the same experience."

of *Ramularia*. Inoculations made with this fungus on the roots of plants that, as far as external examination could show, were in all respects healthy resulted in the formation of lesions which proved to contain *Ramularia*. Although no inoculation experiments have yet resulted in the production of the actual yellow-leaf condition, a number of such experiments, chiefly upon young plants, have been instituted during the present year by Mr. Waters, and it is more than possible that with the approach of the seasons during which yellow-leaf is most conspicuous in commercial areas the disease may manifest itself in the inoculated plants.

FUNGI IN GENERAL.

Although phormium has been recorded as a host plant for a number of fungi, up to the present but little systematic work has been carried out on them, and their distribution in milling-areas and relative economic importance are not known. During the present year, however, a certain amount of preliminary work in this direction has been done by Mr. G. H. Cunningham (Biological Laboratory) and the writer in preparation for an account of the fungous diseases of phormium which it is intended to publish shortly. The following are some of the more important of these fungi:

Heterosporium sp.—This causes large irregular sooty blotches on the under-surface of the leaves, the fibre beneath these blotches becoming red in colour and quite rotten. Where the leaf is badly affected it is therefore rendered quite useless for milling, and even where the attack is slight the fibre will lose many points in grading owing to its bad colour.

Fusarium sp.—Causes large elliptical whitish areas of dead tissue on young leaves, ruining them for milling purposes.

Phaeoseptoria sp.—Is the cause of more or less severe leaf-spotting, accompanied by destruction of the fibre.

Septoria sp.—Causes longitudinal purple stripes on the leaf, ruining the fibre and finally killing the whole leaf.

INSECT PESTS.

As regards insect enemies, phormium affords a good example of how the "balance of nature" may be upset when the advent of man in a new country brings about profound changes in the conditions previously existing there. Although all the insects which now attack the plant are indigenous, it was not until the early years of the present century, when the draining of swamps first entitled phormium to a place among the agricultural crops of New Zealand, that their depredations began to assume a serious aspect.

Leaf-eating Caterpillars.

The larvæ of three moths—*Xanthorhoe praefectata* Walk., *Melanchra steropastis* Meyr., and *Oeceticus omnivorus* Fereday—are responsible for most of the damage done to the leaves, but *Oeceticus* at present does very little harm compared with the other two, of which *Xanthorhoe* is the more important. The name "flax-grub" is generally applied to the larvæ of *Xanthorhoe* and *Melanchra*.

Xanthorhoe praefectata.—The larvæ of *Xanthorhoe* attack phormium on the under-surface of the leaves, which they gouge out in long narrow

grooves from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. or more in breadth and up to several inches in length. In depth the grooves extend nearly to the upper epidermis, the fibre being removed and its continuity thus destroyed. A badly attacked leaf is quite useless for milling purposes. The caterpillars feed at night, hiding in the daytime in the tube-like rolled dead leaves. When they have reached their full size (about $\frac{3}{4}$ in.) they enter the soil to a depth of about 2 in., where they pupate. The moths are nocturnal in their habits, and are very pretty, being pure-white in ground-colour with delicate grey markings on the wings, which measure about $1\frac{1}{2}$ in. in expanse in the female and slightly less in the male. The species is widely distributed throughout New Zealand, and is found wherever phormium occurs. The seasonal history of *Xanthorhoe* is somewhat complicated, and need not be fully gone into here; it is enough to say that there are two distinct generations, a main and an overlapping one, and that each produces two broods in the course of the year. The maximum damage done by the larvæ of the main generation is from the end of July to the middle of September, and again from the middle of December to the middle of January. In the case of the overlapping generation the maximum damage is done in April and May, and again in October and November, but there is no time of the year (with the exception of the early part of February) when phormium is free from larval attack. These periods are only broadly indicative of the seasonal history of the insect, and it must be realized that they are subject to many local and climatic conditions which may considerably modify them.*

Melanchra steropastis.—The damage done by *Melanchra* differs widely from that caused by *Xanthorhoe.* The larvæ attack the leaf along its edge, cutting a deep notch cleanly out, and leaving none of the tissue of the upper surface as is the case with *Xanthorhoe.* The life-cycle of *Melanchra* has not yet been fully worked out, but the larvæ are known to shelter in the dead leaf-tubes in the same way as those of *Xanthorhoe.* As a rule they pupate in the ground, though pupæ have been found in the rolled-up leaves. *Melanchra* has a wide distribution in New Zealand, but, except in Southland, is of quite secondary importance compared with *Xanthorhoe.*

Oeceticus omnivorus.—This is the widely distributed and well-known "bag-moth," the larvæ being protected by strong silken cases which may be seen on a great variety of plants, hanging from the leaves or stems. The larvæ are active through most of the year, and sometimes do a certain amount of damage to phormium, though they are never abundant. Large patches are eaten from the lower surface of the leaf, often extending through to the upper surface and forming more or less circular holes in the blades.

Control Methods.

Three main controlling influences occur in the case of *Xanthorhoe*—namely, floods, predaceous and parasitic insects, and insectivorous birds.

Flooding.—It has already been pointed out that *Xanthorhoe* was of little importance before draining was introduced, and it has been

* Those interested will find a full account of the life-history of *Xanthorhoe*, by Mr. D. Miller, Entomologist, Biological Laboratory, in the *Journal* for October, 1918, the above being simply an abstract from this and other papers by the same writer.

noticed that there has been little damage done by the pest, even in those districts most susceptible to it, after the occurrence of floods. The artificial flooding of infested areas naturally suggests itself. Flooding during larval attacks is not likely to be as successful as during pupation, owing to the probability of the larvæ crawling up the leaf-tubes and thus escaping from the water. Flooding during the period of pupation would no doubt be most effective, but owing to the complexity of the seasonal history of *Xanthorhoe* it is not always easy to select the most suitable time for the operation. There are, however, two periods—(1) from the latter part of July to the end of September, and (2) from December to February—when the greatest number of pupæ from the main and overlapping generations are in the ground simultaneously, and it is at these times (subject, of course, to seasonal variations) that the floodings would be most effective.

Predaceous and Parasitic Insects.—The most important of the predaceous insects is a small hover-fly (*Syrphus ortas*), the larvæ of which prey (though not exclusively) upon those of *Xanthorhoe*. Of the parasitic insects—that is, those which lay their eggs in the bodies of the larvæ, which are later killed by the developing parasite—several species are known, the most important being two ichneumon-wasps (*Ichneumon* sp. and *Paniscus productus*). The former of these confines itself entirely to *Xanthorhoe*, and destroys the larvæ early in their life before much damage has been done, while the latter is slower and attacks other species as well. The usefulness of *Ichneumon* sp. is lessened, however, by its being liable to the attacks of a secondary parasite. It is not considered that any of these insects will do much more than keep *Xanthorhoe* in check, the fact that the moth, its food-plant, and its parasites are all indigenous pointing to the probability of a balance existing between them which could only be upset by the complete elimination of one or other of the controlling factors.

Insectivorous Birds.—The part played by birds in the control of the flax-grubs is not well known. Certainly such birds as pukekos, wekas, &c., have disappeared in many areas where they were once common, the draining of swamps, followed by fires and the increase of rats, weasels, &c., being no doubt the cause of this. It is probable that in the drier parts of the virgin swamps the larvæ and pupæ of *Xanthorhoe* and *Melanchra* were eaten by some of these birds, but the relation between the disappearance of the latter and the increase of the former is a matter of conjecture. The large numbers of starlings which are now often seen in phormium areas probably play a part in the control of flax-grubs, but here again exact data are wanting.

Other Larvæ.

The larvæ of a species of *Porina*, a large moth, have been recorded as damaging and destroying individual fans of phormium by boring into the bases of the leaves, but such damage is not frequent enough to be of any economic importance.

Scale Insects.

Several species of scale insects occur on the leaves of phormium, the following being those most commonly seen: *Mytilaspis cordylinidis* Mask., *Leucaspis stricta* Mask., *Dactylopius calceolariae* Mask., *Coelostoma wairoense* Mask., *Poliaspis media* Mask.

The last-named is often very abundant, covering the whole under-surface of the leaf with a white and woolly mass. Apart from the damage done by the scale insects themselves, many species exude "honey-dew," upon which a black sooty mould grows. The scale insect and fungus together have the effect of softening the leaves and greatly reducing their value.

(Concluded.)

BASIC SLAG AND ROCK PHOSPHATE.

B. C. ASTON, F.I.C., F.N.Z.Inst., Chemist to the Department.

In view of the statement that the United Kingdom quota of Nauru Ocean phosphate has been sold for a year to a Welsh basic-slag company for the purpose of grading up its slag (see *Journal* for June last, page 340) the situation in regard to basic slag has been closely watched by the Department, and a considerable number of samples have been analysed. So far there is no evidence that mixtures of slag and rock phosphate are being sold to farmers as genuine basic slag, or that the citric-acid solubility of the phosphate is unduly low. Although the bulk of the basic slag on the New Zealand market at present is registered with a somewhat lower grade than the pre-war fertilizer (15–17 per cent. phosphoric acid (P_2O_5), as against 17–20 per cent.) there have been only very small importations of the low grade 9–10 per cent. slag. Further samples are being examined, and in the meantime there is no necessity for the farmer to purchase basic slag of lower grade than, say, 15 per cent. phosphoric anhydride (P_2O_5) and 75–80 per cent. citric-acid solubility, and he should insist on this specification as the minimum guaranteed composition.

The London manager of a firm of basic-slag vendors has stated in a letter published in a Wellington paper that the use of rock phosphate has been condemned by the Canadian and United States Government Departments. This is evidently an incorrect presentation of the facts which, as far as these countries are concerned, are also set out in the *Journal* for June, page 337. The climatic conditions of those countries are, moreover, unlike those of New Zealand, which generally are much more favourable to the use of insoluble phosphates than those of the United States or Canada (see last month's *Journal*, page 198). It would be incorrect to say that the fertilizing-value of finely ground rock phosphate in New Zealand is unknown and unproven. Current usage in Southland and the Department's experiments in the North Island have proved its value.

The British *Journal of the Ministry of Agriculture* for September, 1921, page 484, in an editorial note states as follows :—

> Many experiments show that finely ground rock phosphates will do the work of the basic slag and encourage the growth of clovers in the same way, especially on old grassland which is well provided with organic matter, and where the rainfall is abundant. Recent experiments in Essex, where the conditions are comparatively unfavourable, show that the action of rock phosphates compares favourably with that of basic slag. In America the use of ground rock phosphates has become very general. Actual trials with these particular phosphates from the Pacific islands have as yet only been reported from New Zealand, but there is every reason to suppose that they will be even more effective than the ordinary

rock phosphates. . . . The Ministry of Agriculture has no hesitation in recommending farmers to try the mixture of the Nauru and Ocean Islands phosphate and slag for application to grassland at the rate of 4 cwt. to 6 cwt. per acre according to grade, especially upon heavy soils, peaty soils, and all situations where the rainfall is not too light. On arable land the mixture cannot always take the place of superphosphate for the turnip crop, but a dressing of 4 cwt. per acre will form a good basis of continuously acting phosphatic manure for the whole of the rotation. A further 2 cwt. per acre of superphosphate, drilled with the seed for the turnip crop, will give it that initial start for which superphosphate is so valuable. . . . Further experiments have been started to ascertain more accurately the applicability of the Nauru and Ocean Islands phosphate to particular soils and crops. Sufficient knowledge already exists, however, to enable the Ministry to recommend with confidence Nauru and Ocean Islands phosphate to the farmer who wishes to improve his grassland and to lay a good manurial foundation for his arable land.

The quantities recommended in the above extract are, of course, intended for the soil conditions of the United Kingdom, and are not necessarily applicable for New Zealand. This Department's officers are conducting further field experiments with finely ground phosphate rock, and the results will be published in due course.

With regard to the poisonous nature of basic slag, the necessity of allowing ample time for the rain to wash the slag off the herbage before depasturing stock on it is evidently a disadvantage to its use, and, although it is one which in most cases can be avoided, the fact that such poisonings may occur is evidently not universally known, and therefore must be pointed out.

WAIMATE WEST DEMONSTRATION AREA.

OPERATIONS FOR SEASON 1920–21.

J. W. DEEM, Fields Instructor and Supervisor of Subsidized Demonstration Farms.

THE work as outlined in the *Journal* for December last has been continued generally. The season was not ideal for dairying, the autumn being one of the driest experienced for many years. Although there was a good crop of soft turnips on the farm, it was not sufficient to make up for the loss of grass, and the milk-returns suffered accordingly. This may be better understood when it is mentioned that at the end of December the butterfat yield was 1,000 lb. ahead of that of the previous year at the same date, yet the season finished up with a shortage of 440 lb. as compared with the 1919–20 returns. The average for the herd of forty-seven cows was 270 lb., against 279 lb. in the preceding season.

CROPS.

The crops on the whole were good, but great difficulty was experienced owing to the land being badly infested with weeds, especially fumitory and wild turnip.

Roots.—In the main varieties the best results were as follows, all weights given being for roots only, the tops being weighed separately :—

Mangolds : Long Red, 60 tons ; White Sugar, 59 tons 7½ cwt. ; Prizewinner, 54 tons 1 cwt. ; and Jersey Queen, 51 tons 13½ cwt.

Soft turnips: Red Paragon, 47 tons 17 cwt.; and Purple-top Mammoth, 40 tons 10 cwt. The crop of Green Globe was also heavy, but through an oversight it was not weighed.

Swedes: The land on which this crop was grown was so badly infested with wild turnip that it was impossible to get an even stand, and comparisons of weights would not have been reliable. A number of varieties were tested, and were practically free from club-root and dry-rot. The best appeared to be Superlative, Magnum Bonum, Grandmaster, Masterpiece, and Caledonian.

Carrots: Magnum Bonum, 44 tons 3 cwt.; Matchless White, 43 tons 17 cwt.; and Sinclair's Champion, 34 tons 7 cwt. Rennie's Mammoth Short White, a carrot imported from America, also weighed well, and will be further tested.

Sugar-beet: Details of this crop are being published separately.

Lucerne.—Four acres were sown on 8th December under the following systems: 21 in. drills, 14 in. drills, 7 in. drills, and broadcasting, also with and without manure. Grimm lucerne is also being tested against the Marlborough variety. The strike was good, but fumitory and catsear have been hard to control. So far all the drilled areas have done better than the broadcast; the lucerne sown with manure is better than that sown without, and Marlborough is making better growth than Grimm. The latter variety appears to be slower in the spring than the former. This is also borne out in a small area where a number of varieties are being tested.

MANURIAL TESTS.

With mangolds, superphosphate and bone in equal parts; superphosphate 3 parts, bone 1 part, Ephos phosphate 1 part; superphosphate; and basic superphosphate gave the best results. The addition of nitrogen and potash gave no increase in weight. All manures were applied at rate of 5 cwt. per acre. The addition of 3 cwt. of salt per acre gave an average increase of 5 tons 9 cwt.

PASTURES.

The top-dressing experiments have been continued, and nearly all the mixtures used have greatly increased the clover-content of the pastures, but up to the present there is nothing outstanding. As was the case last year, basic super appears to be doing as well as anything. Most of the pasture on the farm is very poor, and it is doubtful if it can be successfully built up by top-dressing; but another season should give an indication as to how far this will be successful. One field has been broken up with the object of renewing the pasture, and in another an attempt is being made to introduce rye-grass and clover by surface-sowing.

GENERAL.

During the year the Manager, Mr. J. Dakers, resigned to take over his father's farm, and Mr. W. J. Lilley has been appointed in his place. The committee at its last annual meeting placed on record its appreciation of the efficient manner in which Mr. Dakers had carried out his duties while managing the farm.

A great many farmers visited the area during the year, and expressed their appreciation of the work being done. This is gratifying to the committee, and should help to stimulate interest in the future.

WORK FOR THE COMING MONTH.

THE ORCHARD.

THE meeting of the export committee set up at the recent Fruitgrowers' Conference to go into matters covering the coming export season in conjunction with officers of the Department, as referred to in last month's notes, was duly held. The chief item of interest is no doubt a recommendation received from the committee to allow a lower grade of fruit to be exported. While this may probably be agreed to, it must be understood that the innovation, so far as New Zealand export is concerned, is on trial only at the request of the growers themselves, and it should not be expected that the Government would stand behind it to the extent of the lower grade being covered by the guarantee of 1d. per pound if the guarantee on export fruit is again forthcoming. As a result of last season's experience, several minor alterations will be made to the working-conditions of the export regulations. The full text of these will be made available at the earliest opportunity to the Orchard Instructors and exporters.

Fireblight is again on the move in northern districts, new season's infection being reported from all the previously infected areas. So far no infection has been reported from other districts than those previously infected, but it behoves every fruitgrower to be vigilant and immediately report to the local Orchard Instructor any suspicious symptoms showing in his locality.

Advice regarding general orchard operations for the main districts are contained in the notes by the Orchard Instructors which follow.

—W. T. Goodwin, Assistant Director of the Horticulture Division.

AUCKLAND.

Apple, pear, and quince: The following spraying programme is recommended for December—Arsenate of lead, ¾ lb. powder or 1½ lb. paste to 50 gallons water, for the control of codlin-moth, every fourteen to twenty-one days, together with commercial lime-sulphur, 1–90 to 1–100, for the control of fungoid disease.

Peach, nectarine, and plum: Growers are advised to spray with commercial lime-sulphur, 1–120 to 1–125, as a preventive against brown-rot.

Citrus-fruits: Spray with bordeaux, 4–4–40, as soon as the fruit has set on the main crop of flowers. Citrus-growers are again reminded of the necessity of removing all wood injured by frost during the winter, otherwise it may lead to fungoid trouble or give opportunity for the entry of borer insects.

—J. W. Collard, Orchard Instructor, Auckland.

HAWKE'S BAY.

Early peaches and plums will soon be in a marketable condition, also a few early varieties of apples. A very pronounced habit of this early fruit is its erratic ripening, and several pickings should be made at intervals to secure the fruit at the correct stage for marketing. Handle all fruit carefully, and never leave picked fruit exposed to the sun, otherwise rapid deterioration is sure to result. With lighter crops than usual it will be more than ever necessary to market the crop in the most attractive condition possible, and care in handling, grading, and packing will do much towards this end.

Though the harvesting of crops will now demand attention, cultivation should not be forgotten. Neglect in this respect occurs too often at this period of the year, with the result that the evaporation of moisture is excessive, and the trees suffer more than need be during dry weather.

Seasonal spraying will consist as follows: Apples, pears, and quinces—For codlin-moth, leaf-roller, and red mite, applications at twenty-day intervals of arsenate of lead, 2 lb. powder or 3 lb. paste, plus an equal weight of lime, and lime-sulphur, 1 gallon to 100 gallons of water. Where powdery mildew is troublesome 6 lb. of atomic sulphur may be added. Woolly aphis usually makes some headway at this time of the year, and for varieties where this is the case Black Leaf 40, 1 pint to 100 gallons, should be added to the arsenate spray. Endeavour to make a direct hit on colonies wherever the woolly substance appears, a direct hit with good pressure being the secret of summer control for this pest. Stone-fruits—For leech on plums apply arsenate of lead, 3 lb. of paste or 2 lb. of powder per 100 gallons of water. With very tender varieties, and when there is a risk of

staining fruit nearing the ripening-stage, hellebore powder, ½ oz. per gallon, should be used instead. Hellebore powder should be boiled for about twenty minutes in a small quantity of water to secure full efficiency. Peaches and nectarines—Lime-sulphur, 1–125, should be applied where brown-rot is expected, the last application being made about fourteen days prior to picking.

—W. H. Rice, Orchard Instructor, Hastings.

NELSON.

Trees overloaded with fruit must have some of it thinned off if the crop is to be kept clean and allowed to colour well. This operation also maintains the constitution of the tree for future cropping, and prevents the breaking-down of valuable leaders. Make a special feature of removing fruit that may have set close about the tops of leaders. When doing this work keep a lookout for fruit affected with codlin-moth or brown-rot, and carefully destroy any which may be found. Spray the trees as previously recommended, avoiding application within two or three weeks of picking.

An orchard clean-fallowed year after year in this district soon becomes harsh and hard underfoot, and the soil goes back in mechanical condition. A green cover-crop, if only of weeds, is necessary to maintain the supply of fibre and humus. These good things, however, are not fully available to the tree unless good clean cultivation is maintained at this season. The trees which are carrying a crop usually need this assistance.

During stormy weather and in odd moments clean up the fruit-store and packing-shed in preparation for the new crop. Boxmaking is another job for such times.

The harvest will now be starting for berries and stone-fruits. Nothing is more objectionable than to receive boxes of stone-fruit of uneven maturity, and this must be guarded against by careful picking. Pack to suit your market. If it is at a distance, and considerable handling is necessary, the goods must be very firm to get there safely; the riper lines must be sent to the handier places. The larger fruits—say, 2 in. and upwards—will look all the better if they are sized and packed like apples.

Spend a little time occasionally in looking at the grafts put on in the spring. Stop growth from the stock below the graft before it has run to any great length. When the scions are established draw a knife through the ties, but do not remove them. See that they do not get blown out by strong winds.

—W. C. Hyde, Orchard Instructor, Nelson.

NELSON CENTRAL.

During this month the land should be well cultivated to obtain the best results with both fruit and wood growth. Where well-cultivated land has become hard and set a further ploughing will be found beneficial, and will facilitate subsequent operations.

Spraying: For black-spot and mildew continue applications of lime-sulphur, 1–100, with the addition of 3 lb. or 4 lb. of milk of lime, or the same weight of atomic sulphur. Mildew is much in evidence at present. Where this is the main trouble, reduce the quantity of lime-sulphur solution and increase the quantity of atomic sulphur, especially if the foliage is showing signs of cracking and dryness through constant applications of the former spray. Cut back badly infected laterals to good clean spurs or shoots, as these are the main source of mildew infection. As red mite is prevalent in most orchards, non-bearing trees as well as those carrying a crop should be sprayed. The same precautionary remarks apply to woolly aphis, for which use Black Leaf 40 at 1–800. Make a point of getting an arsenate-of-lead spray on towards the end of November, as the codlin-moth will be depositing eggs about this time. Repeat the application about three weeks later. Cherry and pear leech will be making its appearance. Apply arsenate of lead, ¾ lb. powder or 1½ lb. paste to 50 gallons water. When ripening-time approaches use hellebore powder, 1 lb. to 20 gallons, in preference to arsenate for cherries and plums. It quickly dissipates and does not mark the fruit.

Timber for fruit-cases should be stacked up to dry. If left in the bundles, especially when not under cover, it is liable to become very discoloured and unsightly in appearance.

—J. H. Thorp, Orchard Instructor, Mapua.

MOTUEKA.

With the month of December the weather will be getting hot and dry. Where cultivation had to be delayed owing to the heavy rains no time should be lost in attending to the work, reducing the soil to as fine a tilth as possible so as to retain the maximum amount of moisture.

Although there is a light setting on many varieties of apples this season, especially in some localities, the thinning of those trees with a good set should not be neglected. The result will be beneficial both as regards quality and size of fruit. It is also advisable at this stage to pick off all malformed, damaged, and diseased fruits. Pay attention to the fruit on young trees, removing all fruits from the tops of the leaders.

The notes supplied last month for this district with regard to spraying will still apply. Where brown-rot is in evidence it is necessary to collect all infected fruits and effectively destroy them. Leaf-hopper in the nymph stage has been noticed in several orchards. This pest is much easier to control when in this stage than when on the wing. If the lime-sulphur sprays do not cope with it, Black Leaf 40, 1–1000, should be applied.

—G. Stratford, Orchard Instructor, Motueka.

CANTERBURY.

Cultivation: Cultivation should now receive special attention, and every effort should be made to reduce the soil to as fine a tilth as possible. Stir the soil when sufficiently dry after rains so as to prevent a crust forming on the surface.

Grafts: Growers are advised to make an inspection of recently grafted trees and remove all shoots and buds appearing below the graft.

Disbudding, &c.: Remove from the roots and trunks all superfluous shoots so that the energy of the tree may be directed toward the development of leaders and laterals. In young trees surplus and misplaced growth which would have to be cut out at the winter pruning should now be carefully removed.

Thinning fruit: Peach-growers should give this important phase of orchard work some attention. Practically all danger from frost is now over. All fruit should be taken off from the tops of leaders of young trees. Remove damaged and diseased fruit. Thin out sufficiently to give the remaining fruits ample room for development.

Spraying of pip-fruits: Apple, pear, and quince—For codlin-moth, leaf-roller, and pear-slug, apply arsenate of lead, 3 lb. paste or 1½ lb. powder to 100 gallons. For red mite, leaf-hopper, woolly aphis, mussel scale, black-spot, and powdery mildew, apply lime-sulphur, 1–100. As alternative treatment Black Leaf 40, 1–1000, plus 3 lb. Sunlight soap per 100 gallons, may be applied for woolly aphis and leaf-hopper; bordeaux, 3–4–50, on pears in localities where black-spot is prevalent; and atomic sulphur or sulphur atoms, 8 lb. to 100 gallons, as a control for powdery mildew. All powdery-mildew-infected twigs should be picked off and burnt.

Spraying of stone-fruits: Apricots and nectarines—For brown-rot, leaf-curl, aphis and red mite, apply lime-sulphur, 1–125. Carefully pick from the trees and gather from the ground all brown-rot-infected fruits and destroy by burning. Plums and cherries—For slug apply arsenate of lead as for apples, &c. For brown-rot apply lime-sulphur, 1–125. Trees infected with silver-blight are again numerous this season. Cut out and burn all dead limbs and branches.

—W. K. Dallas, Orchard Instructor, Christchurch.

OTAGO.

Keep a close watch for black-spot. Lime-sulphur, 1–100, should now keep this in check, but if infection is visible use bordeaux, 3–4–50, this being the better fungicide, although more liable to cause russeting. Spray varieties of apples that are affected with powdery mildew with lime-sulphur, 1–100 or 1–120, or atomic sulphur, 8 lb. or 10 lb. to 100 gallons. As an additional means of control pick off and burn all affected twigs. For green and black aphis on peach-trees, &c., spray with Black Leaf 40, 1–800; 3 lb. soap per 100 gallons improves the mixture. This spray will also be found to help in the control of woolly aphis. Spray apple and pear trees for codlin-moth, leaf-roller caterpillar, and pear-slug with arsenate of lead, 1 lb. powder or 1½ lb. paste to 50 gallons.

Fruit-thinning will still be one of the necessary duties to perform if the best results and prices are to be obtained. Pay particular attention to small varieties of apricots. The result of judicious thinning will be greater weight and better quality of fruit. Muir and Triumph peaches pay well for careful thinning-out, also Burbank plums. Among apples, Scarlet Nonpareil and Cleopatra require special attention, for the sake of the trees as well as the crop. All young apple-trees should have the fruit removed from the previous season's growth, to give the leaders a chance.

Where the main orchard cultivation is completed only light surface cultivation will be needed to keep the weeds in check and retain the moisture in the soil.

—B. G. Goodwin, Orchard Instructor, Dunedin.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

THE GROWING PULLETS AND FOODSTUFFS.

With hatching operations all over the poultry-keeper's chief aim at the present time should be to rear the young stock to maturity possessing the greatest possible health and vigour. To achieve this end there must be no weak link in the chain of management. It is only inviting trouble to conclude that because the chickens have passed through the brooder satisfactorily all special care can be dispensed with. If the pullets are to prove really profitable layers they must not receive a check during the whole of the developing-period. If at any time the birds show signs of an unthrifty condition the cause should be looked for, found, and removed. It may be discovered that the food supplied is not of the right quality, or that a change of food is necessary.

In purchasing foodstuffs for the growing chicken, or, indeed, any class of poultry, too much care cannot be exercised in ascertaining that its quality is good. For example, the composition of some of the prepared meals is a matter of uncertainty, and although they look pleasing to the eye they may not contain the necessary elements to satisfy the requirements of a developing bird. Then, again, much of the so-called pollard on the market is more like bran than the genuine article, while samples of bran have recently come under my notice containing much fibrous material, which may cause endless trouble by blocking the crop and gizzards, especially when fed to young chickens. In the case of the artificially hatched chick (which has no mother to guide it as to what it should eat), foodstuffs containing much fibrous material should never be included in the ration, or trouble thus invited may soon be expected. Especially is this so when sharp gravel or stone grit is not available at all times for the birds to pick. Some people use only finely crushed oyster-shell as grit, but where the gizzard contains fibrous matter this is unsuitable for grinding up the fibre and rendering it in a condition to leave the gizzard. As regards gravel-grit, this should never be supplied to chickens when it contains a large percentage of glittering mineral particles, which they are apt to pick up. These particles accumulate in the gizzard, so that foodstuffs cannot enter it, and the bird soon dies of starvation.

If the growing pullet is to later develop into a heavy layer there are certain essential factors that must not be neglected now, among which are sound and liberal feeding, comfortable housing, strict attention to cleanliness, freedom from insect pests, and plenty of clean water and green-stuff, together with ample provision for exercise and the securing of fresh air.

BROODY HENS.

Keeping the nest-boxes free from broody hens is a matter that must not be overlooked at this period of the year. To allow these birds to sit on the nests day after day not only means a loss in eggs and reduced profits, but it also encourages insect pests. The houses should be visited nightly, and any birds found on the nests should be removed to the broody-coop. In this way in the course of two or three days the bird will usually lose the desire to sit and will resume laying again in a minimum of time. On the other hand, if the bird is not removed from the nest during the first stages of broodiness it may mean weeks before a normal and egg-laying condition is regained.

A broody-coop should be made in three compartments, one section being allowed for each day's broodies. The bottom should be made of narrow battens about 2 in. apart and raised on legs, &c., 8 in. from the ground. Thus, with the free circulation of air in the coop and the bird being unable to retain heat, the broody fever soon becomes broken. The coop should be so arranged that the birds can secure their food and water from the outside. Do not on any account starve the broody hen. If eggs are to be produced in the shortest space of time ample food of the best quality should be provided. Some people resort to most cruel methods in trying to stop hens from brooding, such as shutting them under a box for days without food and drink, or by holding their heads under water until they are almost drowned, or, in extreme cases, compelling them to stand in cold water overnight. Such practices are not only unprofitable but decidedly cruel, and those who adopt them have not the love for fowls they should have, and would be better employed at some business other than poultry-keeping.

MARKING CHICKENS.

The importance of marking the young chickens as a future guide to age-determination, pedigree, &c., is a matter now calling for urgent attention. Perhaps the simplest method is to punch a hole in the web of the foot, keeping a particular section of the web of each bird for the particular strain or season. A special punch for marking chickens can be obtained at a cost of about 2s. 6d. On plants where no system of marking the chickens is adopted it is not uncommon for young hens to be culled out and the old ones retained in the flock, merely because the legs of the former have become affected with scale. It should be always remembered that the amount of scale on a bird's legs gives no indication whatever as to its age. What is known as scaly leg, and which is too often taken by the novice as a guide for separating birds according to age, is due to a parasite and is as likely to attack a young pullet as an adult bird.

As to ducklings, the ordinary chicken-punch is unsuitable, as the holes invariably grow out. The best way of placing a distinguishing mark on the duck's foot for the guidance of age, strain, &c., is to take a V-shaped piece out of the edge of the web of the foot. This should be done with a sharp knife, the foot of the duckling being held on a piece of smooth board during the operation.

Where leg-bands are required for marking adult stock pig-rings are most suitable. The rings can easily be placed on the fowl's leg with the ordinary closing pincers used for ringing a pig's nose, and once on they seldom or never come off. Numbered pig-rings are now obtainable, which adds to their value where trap-nesting or single-penning of birds is resorted to.

THE APIARY.

F. A. JACOBSEN, Apiary Instructor.

REQUEENING.

DURING the early part of the summer the apiarist must turn his attention to requeening the old colonies. The best time to rear queens is from now until January. The object of requeening with young stock is threefold: (1) To help control swarming; (2) to have a young vigorous queen to build very strong colonies; (3) to improve the old stock if possible. No better plan can be followed by the beginner than to utilize queen-cells produced naturally—that is, under the swarming impulse. With the aid of a few nuclei young queens can be hatched and mated, while where a swarm has emerged from the hive, queen-cells or virgin queens can be secured and form an easy solution to the requeening problem. Colonies should be requeened every two years. At the present period of the year everything is favourable to the operation, as the hives are at their highest state of prosperity. Under normal conditions the workers and drones are at their best, this being the swarming-period. In the case of after-swarms, these may be sifted through an excluder placed between two empty supers, when the queen or queens can be removed. The bees will then return to the parent hive.

These young queens can be utilized for starting nuclei. It always seems to me to be a pity to destroy the young vigorous queens bred under the swarming influence, and, providing they are from a good thoroughbred strain, they should be utilized and introduced to failing colonies, the old queens being destroyed. A handy way of introducing virgin queens is by the smoke method. The old queens must first be removed from the hive that is to be requeened. The entrance is then contracted and a few vigorous puffs sent into it. Before the bees have recovered from this treatment the virgin queen is released at the entrance and blown into the hive by several puffs of strong pungent smoke. The entrance is then completely closed for about ten minutes, when a small aperture is allowed. The following day the full entrance may be given.

FORMING NUCLEI.

With the approach of the main honey-flow and the prospect of more settled weather the beekeeper can turn his attention to the question of forming nuclei either for artificial increase or for queen-mating purposes. Whatever the object for which they are produced, the simplest method of forming nuclei is as follows: From the strongest colonies in the apiary take combs of sealed brood with adhering bees. Place two of these combs in each nucleus hive, together with one comb of

honey and an empty comb. It is as well, if the size of the hive will permit, to add a feeder. Close the entrance of the nucleus hive by tacking over it a piece of perforated zinc or wire cloth, and place the newly formed colony in a cool place for twenty-four hours. At the end of this time the hive may be placed on its permanent stand and the entrance opened. Some of the field-bees will return to the parent hives, but in the meantime most of the sealed brood will have hatched. The small colony is now ready for a ripe queen-cell, and under favourable weather conditions will soon possess a laying queen.

Nuclei can be built from strong colonies, each of which should produce four or five nuclei; or several hives in the apiary may each be robbed of a frame of brood, thus providing increase while leaving the full colonies practically undiminished. When the young queen commences laying she should be left in possession until she has filled at least one frame with eggs, when she may be removed and introduced to a colony that requires requeening. The nucleus should at the same time be supplied with a ripe queen-cell and the process repeated as long as young queens are required.

STIMULATIVE FEEDING.

A constant watch must be kept on the stores in the hive. During the flow from the willows and fruit-bloom brood-rearing is largely increased and entails the consumption of considerable stores. As there is usually a dearth of nectar from now to the middle of December, in some cases it will be advisable to feed. For spring or stimulative feeding, as this may be called, a thin solution of sugar-syrup answers the purpose admirably. One part of sugar to five or six parts of water is a suitable strength. The amount to be fed will depend largely on the size and natural requirements of the colony, and must be left to the individual judgment. Colonies that are gently stimulated will respond well to the treatment, and it must be remembered that when the honey-flow commences it is the strong and prepared colonies that store the greatest surplus.

FOUL-BROOD.

As I have frequently recommended, keep a strict watch for foul-brood at all times. Weak diseased colonies are not worth bothering with, and should be destroyed by fire to prevent further infection. This method is adopted by careful and successful beekeepers. Should there be any doubt about the disease, a sample of suspected comb should be forwarded to the Apiary Instructor for the district or to the Director of the Horticulture Division, Wellington, for diagnosis.

POINTS.

Do not neglect to rear or purchase sufficient young queens to replace the old or failing ones.—Breed your young queens from the best stock in the apiary.—Keep down a predominance of black drones.—Keep the long grass clipped away from the hive-entrances.—Be sure and provide sufficient ventilation for the needs of the colony, and thus help to control swarming.—If there is no water handy to the apiary, supply some in a shady place.

VITICULTURE.

J. C. WOODFIN, Vine and Wine Instructor.

THE VINEHOUSE.

Several specimens of vine-leaves, shoots, and berries have been sent in recently for advice as to the nature of the disease from which they were suffering, and as to the remedy to be applied. No signs of disease were discovered, but in every case there was what is known as scalding or browning. This usually occurs in the early morning when the sun is rising, and is caused by the effect of its heat on the foliage still covered with condensed moisture. The parts affected are often shaded from the sun, thus giving rise to the supposition that the discoloration is due to a fungoid disease. To guard against such damage the top ventilators should be slightly opened before the sun rises, so that the condensed moisture may be evaporated and the surface of the foliage left dry by the time the full heat of the sun is felt. On cloudy days the same mishap may occur, hence a careful watch should be kept on the ventilation. Discolouring of the grapes may also be caused by handling them with dirty or rough hands, or by allowing them to come in contact with the head.

Several cases have also come to my notice of vines being destroyed or seriously damaged by the use of benzine, kerosene, or other oils in combating meal-bug. If any of these liquids are used they should be applied to the insects only, not to the wood, as they readily soak into the porous bark of the vine and destroy the tissues.

The following are other errors often committed by beginners :—

Burning sulphur in the vinehouse : Sulphur is sometimes burnt on a fire or on hot cinders with a view of killing red spider or other insect pests. The fumes emitted from burning sulphur will, it is true, kill the insects, but they are also deadly to human and vegetable life and so should never be used in a vinery or plant-house.

Burying dead animals near vines : This idea, handed down from traditional sources, seems to appeal greatly to inexperienced growers. Instead of decomposing flesh being of benefit to the vines, it will poison the soil, kill the roots, and do serious injury to the whole of the vine, which does not need such rank garbage to feed upon.

Growing plants in the vinehouse : There is always a risk, when plants of any other kind are grown in the same structure as vines, of the former harbouring insects or diseases which may also attack the vines. For this reason they may only be grown in the vinehouse when strict attention is paid to keeping them free from pests.

Feeding vines : Some beginners are not contented unless they are constantly dosing the roots of their vines with artificial or liquid manures. While it is true that vines profit by a liberal diet when in good health, it by no means follows that they require an excessive amount of feeding. Occasional feedings and top-dressings, as previously recommended, are all that is necessary. On no account give manures to sickly vines—it will only make them worse and hasten their decease. Nor should manure be applied to newly planted vines.

Growing vegetables in the borders : The borders should be as wide as the rafters are long, and should not be used for growing vegetables or other plants. Many people do so use them, and then wonder why the vines fail to give satisfaction. Vines require all the food they can obtain from a wide well-kept border.

VINEYARD AND CELLAR.

Make use of the scarifier to keep down weeds and to work up a fine tilth on the surface, so as to retain the moisture in the soil. Keep a sharp lookout for fungoid diseases, especially when the atmosphere is moist and sultry.

In the cellar, keep the vats and barrels well filled up. Watch the wines closely for any signs of fermentation or disease. They are very liable to start fermenting with the increasing heat. In the case of dry wines moving, racking them into sulphured casks will generally prevent further fermentation and prevent disease setting in. White wines becoming turbid in the bottles should be emptied into a well-sulphured cask, fined, and racked when perfectly bright. This may require five to fifteen days or more.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

THE next six weeks should be a very busy time in the vegetable-garden, as the winter supply mainly depends on work done during that period, and there are also the autumn requirements to be arranged for. Succession crops of peas and dwarf beans should be sown, also turnip, lettuce, spinach, and radish. Seedling crops, such as parsnips, carrots, and beet from the main sowing, should be thinned while quite small. If seeds were sown thinly, as they should have been, thinning is not a formidable task, and the smaller the plants are the quicker the work can be done. A good way of thinning is to take a piece of hoop iron, such as is used to strap cases, cut a piece about 8 in. long, turn over at right angles about ¾ in. at one end and file the edge sharp. With this implement spare seedlings can be easily cut out, and also weeds growing in the lines of seedlings. The spaces between the rows should be loosened a day or two before with a flat hoe, or Planet Jr. cultivator, so that weeds may wither. After thinning cultivate the soil again : a loose and clean surface encourages the plants to grow.

Early celery-plants should be growing well. See that they do not lack water; they require a good deal, and will not thrive without it. Later seedlings should be ready for pricking-off. In a good many places pricking-out, all except the first lot, can be done in the open ground. Where the climate is hot, however, this cannot be done, as the soil dries so quickly that the young plants wither up. In such places pricking-out must be either in boxes under lights or in beds of soil under lights; on the whole the former method is the better. The soil for the boxes should contain a fair amount of humus, which encourages the formation of roots, a good root-growth being more important than size of plants. Rich manure in the soil would cause top growth without many roots, and should be avoided. The humus may consist of very old stable or cow manure, leaf-mould, or mould from decayed vegetable debris. No artificial fertilizer should be used. The boxes should be heaped up more than full, the surplus stroked off with a piece of batten, and the soil then pressed firm. To prick out, first mark lines by pressing a strip of lath into the soil, the seedlings, which should be very small, being then pricked into the lines. This makes spacing and keeping straight lines an easy matter. Space the seedlings 2 in. apart. When a box is filled with seedlings give a good watering and place it in a frame; shade for a few days. If watering is properly attended to good plants will be secured.

Tomato-plants should by now have commenced to make growth. See that energy is not wasted in growing side shoots that will have to be cut off by suppressing such growths as soon as possible. Keep the soil well cultivated and free from weeds. Spray about every fourteen days. If heavy rain occurs soon after spraying—that is, before the mixture has thoroughly dried—the spray should be repeated as soon as possible. The spray may be 4–4–40 bordeaux, or, alternatively, 6 lb. of washing-soda may be used in place of 4 lb. of lime in the mixture.

Autumn Giant cauliflowers should be planted before the end of December, also Brussels sprouts. The latter do indifferently well if planted several weeks later, but early planting is necessary to secure the best results.

Brassicas for winter use comprise broccoli, cabbages, savoys, &c. Early broccoli are the first planted, a start usually being made in November. Planting of the greater number of subjects that come under the heading of brassicas takes place during the four weeks beginning with the last week in December. About 25th November is the time to sow cabbages, savoys, coleworts, and late broccoli in the warmer districts, the plants being then ready to set out at the time stated. In the colder districts an earlier start must be made.

Rabbit Districts.—The *New Zealand Gazette* for 13th October notifies the formation of two further rabbit districts in the Auckland Province—namely, Kawa West and Kahuwera.

Importation of Plants into Fiji.—Owing to the existence in New Zealand of fireblight, the Government of Fiji has issued an order prohibiting the importation into that country from New Zealand of the following species of fruit and plants: All members of the natural order Rosaceae, which includes apples, pears, medlars, quinces, roses, hawthorn, &c.

Trophies for Farmers' Field Competitions.—Messrs. Sutton and Sons, of England, through their New Zealand agent, have presented two silver cups, value 25 guineas each, for the best mangold crop grown by a competitor in these competitions, the cup to be won three times before it becomes the property of the winner. One cup is for the South Taranaki district, and the other for the Wanganui district. Competitors may use any firm's seed.

Charges for Seed-testing.—The following circular was issued last month by the Department's Biologist to the seed trade and others: "Owing to the fact that the expenditure in connection with seed-testing has largely exceeded the revenue received for the work, it has been found necessary to increase the charges to 2s. per sample for germination and 2s. for purity. The increased rate is to date from 1st November, 1921. It is with great regret that it has been found necessary to increase the charges, but as it has been decided that this service should be more or less self-supporting an increase in the rates has become imperative."

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith Letters should be addressed to the Editor.

PARASITIC GASTRO-ENTERITIS IN YOUNG CATTLE.

F. H., Takapau :—

Will you kindly inform me if there is any specific treatment for parasitic gastro-enteritis in young cattle ; if not, what would the general treatment consist of ?

The Live-stock Division :—

The parasites which produce this condition pass a certain portion of their life-history in damp and even wet surroundings. Dry bright weather exerts a restraining influence, while warm, muggy, and misty weather has an opposite effect. Pastures which are known to harbour the parasites should be drained, and either limed or top-dressed with coarse salt, and should be closed to young cattle and sheep. It is necessary that affected animals should be removed to clean and dry pastures during treatment, and that they should be given a plentiful supply of nourishing food to enable them to withstand the attack of the worm. There is no specific medicinal treatment, though many drugs have been tested, including picric acid, thymol, beta-napthol, lysol, and sulphate of copper. None of them have been proved completely successful. Experiments with sulphate of copper on sheep have most nearly approached success, and when compounded with sodium arsenite the effect has been much improved. The dose used is sodium arsenite 1½ grains, and copper sulphate 8 grains. This may be given either in pill form or in solution. Calves up to four months should take much the same dose. An increase of ½ grain of the arsenite for each month after that, with a corresponding increase in the copper salt, should suffice. A period of twenty-three days is the shortest time in which the parasite passes through its stages of development in the sheep. Experiments indicate that a single dose monthly killed all the worms taken up by the animal during the thirty days since the previous dose. The dose of copper sulphate alone, if you should desire to try such a course of treatment on your calves, is the same as recommended above.

CONTROL OF PIRIPIRI.

A. HEGARTY, Whatatutu :—

Biddy-biddy has become a real pest in many parts of Poverty Bay, and is spreading rapidly. Have you any recommendation that would be of assistance in checking or eradicating it ?

The Agricultural Instruction Branch :—

The control of piripiri (" biddy-biddy ") is very difficult, particularly on pastoral lands. The most successful method of prevention is the carrying of a larger proportion of cattle, and subdivision. Where the land is already infested the pest can be greatly reduced by shutting it up in the spring, and allowing the grass to grow rank. Then, in the autumn, stock heavily with strong cattle, or burn and sow more grass-seed, the former method being preferable. Where the land is kept bare the piripiri runs along the ground and roots at every node or joint, whereas if the grass is allowed to come away as suggested it carries the weed with it and so greatly weakens the root-system. Then, during the autumn feeding, the cattle pull a great many of the plants out by the roots. Areas shut up and grazed as suggested show a wonderful improvement, and if judiciously stocked afterwards go on improving. For autumn grazing plenty of water should be provided, and the cattle should be strong and be removed from the area before they have gone back in condition.

STRAWBERRY-CLOVER FOR SWAMP LAND.

J. EDMONDS, Mata, North Auckland :—

I have seen strawberry-clover advertised as a good cattle-feed and as a plant which does well in swamps. Kindly let me know its virtues and its drawbacks, as I have a drained raupo swamp which I wish to lay down in this clover if it should be suitable.

The Agricultural Instruction Branch :—

Strawberry-clover has not been as fully recognized as it should have been. It is relished by all kinds of stock, and stands moisture well, especially in some of the damper and colder districts of the North Island, where it practically grows wild. It also does well in the vicinity of salt water. The best time to sow would be in March, together with other mixtures, when sowing the land down to grass. In a favourable summer good feed will be obtained, but if there should be a drought very little feed will be obtained from strawberry-clover alone, even in a swamp. We therefore advise sowing it in a mixture of grasses.

ITCHING HEELS IN HORSE.

"REX," Roxburgh :—

Will you please give me a cure for itching heels in a horse—it is always kicking and rubbing its heels on fences and implements.

The Live-stock Division :—

For itching heels in horses the following may be recommended. Wash the legs thoroughly with lukewarm water and soap, using a dandy brush to ensure the removal of all dirt and scurf; dry the legs with a rough towel, and allow the animal to stand for an hour or so to make sure that the hair and skin are perfectly dry; then apply the following mixture by rubbing in with the hands: Sulphur 6 oz., linseed-oil (or preferably olive-oil) 12 oz., oil of tar 4 oz., turpentine 2 oz. Mix well together. It is advisable to keep the horses out of mud and wet places as much as possible.

HARVESTING GORSE-SEED.

"GORSE," Springfield :—

Will you kindly give me information as to when and how to harvest gorse-seed.

The Agricultural Instruction Branch :—

Gorse-seed in your district would be ready to harvest about December. The most convenient method of harvesting is to place a tarpaulin or other sheet under the bushes and beat the branches to knock the seed out.

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TEAT-OBSTRUCTION IN COW.

F. S. WARD, Raetihi :—

One of the teats of a cow which has just come into profit is blind, but I find that the milk may be drawn off by means of a siphon inserted in the teat. Could you advise treatment which would make the siphon unnecessary, or can nothing now prevent the teat going permanently blind?

The Live-stock Division :—

Teat-obstruction is usually the result of one of three conditions: (1) The growth of fibrous bands in the canal; (2) granular growths; or (3) calculi or stones. Your case appears to be in the first category. Various "sounds" have been put on the market for the purpose of breaking down these obstructions, but they are not recommended unless used under the strictest antiseptic conditions. It would be advisable to continue with the siphon, in the hope that the lumen of the tube will be expanded. Manipulation of the teat before and after insertion should be of advantage.

FERTILIZERS FOR TOMATOES.

JOHN W. PRICE, Ferry Bridge, Spring Creek :—

In the monthly garden notes in the September issue of the *Journal* the use of sulphate of ammonia in conjunction with sulphate of potash is recommended for tomatoes. I would like to be advised as to the quantities required for, say, 50 gallons of water.

The Horticulture Division :—

Allow ½ oz. of sulphate of potash and the same amount of sulphate of ammonia for each 4 gallons of water. If you have not already applied superphosphate it will be appropriate to add 1½ oz. to each 4 gallons of the mixture.

CONTROL OF RAGWORT.

A. A. MULINDER, Otawhao, Norsewood :—

Will you kindly let me know the best method of eradicating ragwort, which is very prevalent in this district. Most of the settlers pull the plants when in flower. In this case, would broken roots left in the ground grow again next season ? I notice that when cut off level with the ground the plants spring up again.

The Live-stock Division (Noxious Weeds Inspection) :—

Where ragwort is pulled it generally grows again from the roots left in the soil, as also happens when the plant is cut off level with the ground. The plant, being a perennial, will grow from the same root for three years. It is thus propagated both by seed and roots. Where it is possible to keep the land well stocked with sheep during the early spring months, when the plant-growth is young and tender, no trouble will be experienced in keeping it in check and eventually in eradicating it. Where the land cannot be altogether given over to sheep, excellent results have been obtained in many parts of the Dominion by grazing a number of old ewes along with the cows on the pastures during the late winter and spring months, these ewes eating the soft crown out of the plant when it first appears. The ewes can then be sold off fat in the summer. When either of these methods cannot be adopted, frequent cutting or pulling up immediately before the plants flower will be found effective. The plants will have to be so dealt with for three years, however, before the weed is eradicated from the land. Ragwort is a very free seeder, and if it is allowed to flower and seed the ground will become polluted, and will take at least three years to thoroughly clean again. In the foregoing it has been assumed that the land in question cannot be cultivated. Cultivation soon suppresses it, in spite of its perennial character and free production of seed.

HAND-FEEDING OF LAMBS.

"LAMB," Mount Ross, Sutton :—

Could you recommend a substitute for milk in feeding pet lambs ? I have not sufficient cow's milk for them, and would like to eke out what I have with something else.

The Live-stock Division :—

It is bad practice to attempt to hand-feed lambs without a plentiful supply of fresh milk, and you are sure to meet trouble, if not complete failure. Although the analysis of cow's milk differs considerably from that of ewe's, lambs may be successfully reared on it, provided the necessary patience and care are exercised, especially during the first fortnight of the lamb's life. In the absence of fresh cow's milk, the preserved article may be used in the condensed or dried form ; but this is expensive, and its use is not always followed by satisfactory results. For the first two weeks lambs subsist entirely on milk, and when hand-fed small quantities must be given every three hours, starting at 6 o'clock in the morning and finishing at 9 o'clock at night. The quantity at each feeding for the first three days should be from 2 oz. to 4 oz., depending upon the condition of the lamb, and should be fed from a clear glass bottle provided with a teat in which the hole is small. The addition of sugar of milk and lime-water to the milk is beneficial. Good results are obtained from the following mixture : Fresh cow's

milk, 1 pint; water, in which 2 oz. of lime-water has been mixed, 1 pint; sugar of milk, 1 oz. After the third day the quantity can gradually be increased to 6 oz. at each feeding, and at the end of a week a teacupful is about the proper quantity. As the lambs grow older and begin to nibble grass the intervals between feedings should be lengthened, and the quantity increased until 1½ pints is allowed three times daily. In the meantime the quantity of water is reduced, and the sugar of milk, which is expensive, replaced by a small quantity of brown sugar. These changes must be carried out gradually. A large piece of rock salt should be placed in the pen, and if they are valuable stud animals a cupful per lamb of equal parts of crushed oats, linseed, and peas should be allowed daily. The milk must be given fresh and sweet, and the dishes kept scrupulously clean. As weaning-time comes on, feed twice daily, giving less at feeding. There is no satisfactory substitute for cow's milk, and lambs cannot be reared without it. At the current rates hand-feeding is expensive, and unless they are stud lambs it is questionable if the return is worth the time, trouble, and expense.

FOWLS FOR SETTING.

SUBSCRIBER, Canterbury:—

Will you kindly inform me which is the best breed of fowls to keep for setting purposes?

The Chief Poultry Instructor:—

This question depends more on strain than any particular breed that could be mentioned, as there are good and bad layers in all the popular breeds that we have at our command to-day. Usually the poorer the layer the greater will be the tendency for it to become broody. Thus you may be recommended to secure some birds conforming more to the table than to the laying type, whether they be White Rocks, Orpingtons, Wyandottes, or other breeds.

A. and P. Society.—Incorporation of the Nuhaka Agricultural and Pastoral Society, Hawke's Bay, was gazetted on 20th October.

Albany Fruit Show.—The annual show of the Albany Fruitgrowers' Association will be held at Albany on 25th February, 1922.

Back Number of Journal.—The Editor would be glad to receive a copy of the April, 1911, issue of the *Journal* from any reader having an unrequired monthly number of that date.

Noxious Weeds.—Recent declarations under the Noxious Weeds Act by local bodies comprise the following: Uawa County Council—Bathurst burr, foxglove, gorse, and milk-thistle; Te Puke Road Board—Gorse, broom, Bathurst burr, and foxglove; Onerahi Town Board—Gorse; Whangamomona County Council—Barberry.

Contagious Abortion: The Uterine Douche.—A correspondent asks how many spoonfuls of permanganate of potash should be put to a pint or quart of water to make the 2-per-cent. stock solution mentioned on page 127 of the *Journal* for August last. The quantities are two teaspoonfuls to a pint, or double for a quart. As an alternative, the solution can be prepared ready for use by adding half a teaspoonful of the crystals to a gallon of water, taking care that all the crystals are dissolved before use.

Land for Discharged Soldiers.—The following lands will be made available for discharged soldiers during the next two months: In Auckland Land District thirteen sections, known as the Orongo Settlement, with a total area of 637 acres, in areas ranging from 35 acres to 73 acres. The settlement is situated on the western bank of the Waihou River, about two miles and a half from the Township of Turua, in the Hauraki Plains County. The general quality of the land is good, and should be suitable for dairying. Twenty sections in Wharepapa Survey District (Wharepuhunga Block), in areas ranging from 182 acres to 506 acres, will be balloted for on 16th December. In Southland Land District two sections in the Aparima and New River Hundreds, with a total area of 292 acres, will be offered on 14th December.

LIVE-STOCK IN NEW ZEALAND: 1921.

Unless otherwise specified, the enumeration is at 31st January, 1921.

Land District.	Horses.	Asses and Mules.	Cattle (including Dairy Cows).	Dairy Cows.		Number of Sheep shorn, 1920–21.	Number of Lambs tailed, 1920–21.	Sheep (including Lambs) as at 30th April, 1921.	Pigs.	Goats.	
				In Milk.	Dry.					Angora.	Other.
North Auckland ..	38,281	74	419,398	124,553	18,149	668,138	255,757	678,219	49,026	901	2,014
Auckland	49,844	9	630,957	212,700	25,326	922,535	365,950	930,647	74,841	613	1,673
Hawke's Bay	35,729	73	456,300	44,576	9,904	5,107,703	1,990,059	5,274,725	20,880	837	1,023
Taranaki	22,452	4	362,379	159,621	12,881	893,823	314,467	800,462	51,310	493	3,559
Wellington	45,290	16	619,244	138,619	16,175	4,990,318	2,148,518	5,177,801	54,085	890	574
Nelson	8,073	5	59,555	19,846	3,488	411,399	187,883	488,606	12,303	1,010	1,217
Marlborough	7,303	7	43,333	11,777	1,621	985,788	419,401	1,095,620	7,546	599	1,533
Westland	2,632	3	42,399	8,907	2,600	55,300	30,539	62,491	3,938	22	78
Canterbury	63,851	32	205,904	69,794	9,733	4,053,772	2,242,178	4,499,867	50,286	165	108
Otago	36,388	22	136,307	43,831	7,479	2,495,841	1,033,790	2,782,483	15,833	1	12
Southland	27,416	..	163,447	55,996	7,090	1,338,392	626,006	1,494,110	9,844	2	43
Dominion totals ..	337,259	245	3,139,223	890,220	114,446	21,923,009	9,614,548	23,285,031	349,892	5,533	11,834
Totals, 1920 ..	346,407	262	3,101,945	782,757	110,697	23,075,250	9,447,752	23,914,506	266,829	5,477	9,087

EXPORT OF FRUIT TO ENGLAND.

A COMPREHENSIVE report has been made to the Department by Mr. G. Stratford, Orchard Instructor, on last season's (1921) shipments of fruit (apples and pears) from New Zealand to London, and matters connected with the export fruit-trade generally. Mr. Stratford was in England when the season's shipments arrived and during the marketing of the fruit, and was commissioned to make investigations. He summarizes his main observations and recommendations at the close of the report as follows :—

Varieties.—Some varieties of apples are liked better than others on the London market, and it is advisable, as far as possible, to reduce to a minimum the number of varieties sent, forwarding those that are favoured and likely to be appreciated on the market. Merchants favour big lines of a few good varieties, enabling them to establish a name for such, so that, with the grade and pack of the best, they can sell on the brand. Some of the varieties grown by us are practically unknown to the buyers at the other end, and until a variety is known buyers have to rely on the quality, consequently only the best should be sent. Although Cox Orange Pippin is on the whole a bad carrier, it will always find favour, and the best prices ruling will be given for good stuff. There need be no fear with regard to Jonathan. It is an apple that is in constant demand, and is especially appreciated in the north of England. London Pippin is not very well favoured, being too easily bruised. From the high prices realized for Dunn's Favourite last season this apple must be appreciated, and, providing the standard quality is kept up, should continue to pay well on the London market. Many buyers call for a good yellow apple, according to their class of trade, and in this respect Dunn's Favourite meets the situation. Statesman, though very little known, should find favour on the market. King David is being asked for, providing the colour is not too dark. Although Worcester Pearmain arrived in bad order last season, there is no reason why it should not be shipped successfully and prove profitable. Adams Pearmain is in good demand. Cleopatra and Newton Pippin are two varieties that always command the highest prices, and it is advisable to ship as many as possible. Rome Beauty carried well, and, although somewhat on the green side, was favourably commented on. Delicious, where known, is very highly spoken of, and should equal in price anything sent to the market. Sturmer is eagerly sought for, and should always realize a satisfactory figure.

Bushel Weight.—Cases should contain 40 lb. of fruit. Everything is sold on the 40 lb. basis, and the English buyer strongly objects to 37 lb., which he got in many cases this last season.

Size.—The size of fruit was the subject of much comment from merchants handling our fruit. Large apples are not wanted on the London market. Merchants do not want to handle them, and retailers will not buy them. Undoubtedly the best sizes for the London market are from 2½ in. to 2½ in., with nothing over 2¾ in., the number of this latter size being reduced to a minimum. Another reason why buyers object to the large apple is that a case very rarely goes 40 lb. Again, the larger apples do not carry well, the waste being much greater than with the smaller sizes.

Packing.—The packing of the fruit should not be so tight as to cause bruising, and it is inadvisable to try and get a bulge on our cases as they are made at present.

Number in Case.—The number of apples in the case must be correct and legible. Complaints were received with regard to this. This matter should be strictly attended to in future.

Marks and Labels.—To facilitate handling it is necessary to reduce the markings on the case to a minimum. Both ends should have the shipping-mark. A label giving full information, including shipping-mark, should be attached to one end, the other being stencilled with the shipping-mark, variety, number of apples, and registered number.

Wiring.—The wiring of the cases is a great improvement, and it is recommended that it be made compulsory with all future shipments. Merchants speak very highly of it.

Packing-material.—The use of corrugated paper in preference to wood-wool is suggested. Consignments coming forward packed with corrugated paper appeared to open up in better condition than where wood-wool was used.

Consignees.—The sending of fruit direct to fruit firms is recommended, but only to those having the full confidence of the trade.

Early Shipment.—It is advisable to send shipments as early as possible, consistent with the correct stage of maturity. The market is usually fairly bare at the time of arrival of the first boats from Australia and New Zealand, the American fruit being then practically off the market.

Late Shipments.—Late shipments, to arrive in London during July and August, are not advised, owing to the clash with English and Continental small-fruits. The markets are then fuller, and people are inclined to drop apples for a time, after having had them for so many months, in preference for soft fruits.

Market Ports.—It is recommended that all fruit be sent to London until such time as there are direct steamers elsewhere. Glasgow, Liverpool, Hull, Cardiff, and Southampton could dispose of a large quantity of our fruit successfully.

Shipping Temperature.—Experiments should, if possible, be carried out with regard to the temperature at which fruit carries most successfully. Much good work in this respect is being done by the Fruit Research Committee, Botany School, Cambridge University, and some useful information might be gained by getting into touch with this Committee.

Self-registering Thermometers.—The shipping companies should be approached with regard to the installation of self-registering thermometers on the boats carrying fruit.

Stowage on board Ship.—When loading the boats in New Zealand it is advisable to stack fruit going to the different firms *en bloc*. This was not done last season, and there was much confusion in consequence when unloading at the docks in London. As the shipper has to pay all handling charges, this matter should be attended to.

Extra-fancy Apples.—A trial shipment of extra-fancy apples—Jonathan, Cleopatra, and Delicious—packed in trays and sent to large retail establishments in London, should be given consideration.

Freight Rates.—The high freight existing at the present time is doing much to kill our trade, especially with the possible lowering of prices on the Home market. No effort should be spared to get a reduction.

Advices.—All information with regard to shipments, merchants, &c., should be sent to the High Commissioner, London, as early in the season as possible, so as to enable officers there to get into touch with merchants receiving the fruit. Australia is very up-to-date in this respect.

Advertising.—Advertise New Zealand fruit fully by holding exhibitions during the export season.

Representation.—The presence of a special representative in England during the export season until the business is firmly established—possibly another two seasons—is advised.

IMPROVEMENT OF FRUITS BY BUD-SELECTION.

A GENERAL meeting of the Bud-selection Committee, which consists of representatives of the fruitgrowing and nurserymen's industries and the Horticulture Division, met in Wellington on 17th October. The object was to consider what definite steps should be taken to further the movement and place bud-selection on a sound footing, so that the Committee may commence securing tree-performance records, and later supply certificated propagating-material of the finest strains of each variety to the fruitgrowers and the nurserymen. The Director of the Horticulture Division (Mr. J. A. Campbell) presided, and outlined the steps that had already been taken. He spoke of the keen interest that had been aroused all over the Dominion, of the great possibilities of improvement in our fruits, and of the economic value of the bud-selection movement to the country as a whole. He considered the time had arrived when a definite organization should be set up and practical work started. The honorary secretary (Mr. George A. Green) read letters received from the Californian Bud-selection Association and Professor A. D. Shamel, of Riverside, California. These gave valuable information in regard to some of the work done in the United States, and advice as to the best methods to adopt for starting in New Zealand. Professor Shamel stated that New Zealand must be prepared for about five years of investigation work before practical results would be available. Mr. A. W. Hamilton was added to the Committee as a nurserymen's representative in place of Mr. Thomas Horton. Messrs. W. T. Goodwin (Assistant Director) and W. H. Taylor (Horticulturist), of the Horticulture Division, were appointed as additional departmental representatives. It was resolved to ask the New Zealand Fruitgrowers' Federation to nominate three additional representatives to the Committee, so as to make the Dominion representation complete. It was decided

that the Bud-selection Committee should register under the Industrial and Provident Societies Act, the name to be finally decided later. The name favoured by the meeting was the New Zealand Nomenclature and Bud-selection Board. Messrs. Campbell, Attwood, and Green were appointed to draw up a constitution and rules, also to prepare a suggested plan of finance and a scheme of work for submission to a later meeting. It was decided that Auckland, Hawke's Bay, Nelson, Canterbury, and Otago be constituted bud-selection areas; and the secretary was requested to visit these areas as soon as possible, and assist in setting up recording committees in each area for the collection and tabulating of data and records of actual individual tree performances, with a view to bud-selection as soon as the necessary information is available. The local area committees are to consist of the Orchard Instructor for the district, the local members of the Bud-selection Committee, and others who may be willing to assist in the work.

THE SEASON'S LAMBING: NORTH ISLAND ESTIMATE.

From estimates furnished by the Inspectors of Stock in the various districts, the average lambing for the current season in the North Island is estimated at 89·65 per cent. With 6,312,456 breeding-ewes in the North Island, as shown in the 1921 sheep returns, the number of lambs is estimated at 5,659,117. The corresponding figures for last year showed a lambing percentage of 87·95 and 5,838,704 breeding-ewes. South Island and Dominion estimates will appear in next month's issue.

ESTIMATED AREAS UNDER WHEAT AND OATS.

The following estimates of the areas under wheat and oats in the Dominion for the current season have been issued by the Government Statistician, the figures being based on the usual card census: Wheat—North Island, 9,000 acres; South Island, 354,000 acres: total, 363,000 acres. Oats—North Island, 64,000 acres; South Island, 406,000 acres: total, 470,000 acres. The corresponding totals for the previous season (1920–21) were 222,843 acres of wheat and 574,729 acres of oats. In the current season's wheat sowings the areas under the different varieties are given as follows: Tuscan or long-berry, 212,850 acres; Hunters (various), 86,411 acres; Velvet or Pearl, 38,321 acres. The varieties comprising the balance of the total wheat acreage are unspecified.

FORTHCOMING AGRICULTURAL SHOWS.

Auckland A. and P. Association: Auckland, 2nd and 3rd December.
Wyndham A. and P. Association: Wyndham, 3rd December.
Hauraki A. and P. Association: Paeroa, 7th and 8th December.
Southland A. and P. Association: Invercargill, 13th and 14th December.
Horowhenua A. and P. Association: Levin, 18th and 19th January.
Woodville A. and P. Association: Woodville, 24th and 25th January.
Pahiatua A. and P. Association: Pahiatua, 27th January.
Te Puke A. and P. Association: Te Puke, 2nd February.
Clevedon A. and P. Association: Clevedon, 4th February.
Feilding I., A., and P. Association: Feilding, 7th and 8th February.
Matamata A. and P. Association: Matamata, 9th February.
Dannevirke A. and P. Association: Dannevirke, 8th and 9th February.
Omaha and Pakiri A. and P. Association: Leigh, 15th February.
Waimarino A., P., H., and I. Association: Raetihi, 16th February.
Rodney Agricultural Society: Warkworth, 18th February.
Rangitikei A. and P. Association: Taihape, 23rd February.
Franklin A. and P. Society: Pukekohe, 24th and 25th February.
Marton District A. and P. Association: Marton, 1st March.
Katikati A. and P. Society: Katikati, 9th March.
Ashburton A. and P. Association: Ashburton, 15th and 16th March.
Murchison A. and P. Association: Murchison, 17th March.
Mayfield A. and P. Association: Mayfield, 24th March.
Methven A. and P. Association: Methven, 30th March.
Temuka and Geraldine A. and P. Association: Temuka, 30th March.
Oxford A. and P. Association: Oxford, 6th April.